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NHILL FARM COMPETITIONS.

Report by W. Gamble.

THE BEST FARM EXCEEDING 640 ACRES.

The points fixed by your Society and submitted to me to work on are as follow :—

	Points.
(A) The best system of cultivation, rotation, &c., pursued on each farm inspected	15
(B) The best system of manuring the land, names of manures, and quantities used per acre	10
(C) The best system of saving stable and other manures on each farm	5
(D) The best and cleanest growing crop	10
(E) The best system of fallowing and working of fallow ...	15
(F) The best and most profitable classes of live stock kept on each farm	15
(G) The best implements and machinery kept and used on each farm	20
(H) The condition and system of fencing	10
(I) The best kept kitchen garden and orchard	10
(J) The best provision for water supply	30
(K) Best arrangement and system of dwelling and farm building	20
Total	160

There are six competitors in this section, and it is only after the most careful and thorough investigation into all the details that I have arrived at the results as placed before you. I may state that I will be pleased to give my reasons to any of the competitors as to how points were given in any particular item. This is only fair, as the competition is held for the purpose of education and improvement in agricultural pursuits, and when a competitor knows the reason why a judge lops off points in a particular direction he may be able to remedy the deficiency on some other occasions.

The following are the results:—

Name.	A	B	C	D	E	F	G	H	I	J	K	Total.
Maximum points ...	15	10	5	10	15	15	20	10	10	30	20	160
Geo. Batson	14	8	4	8	12	12	18	4	10	22	10	122
W. Sanders ...	12	8	2	6	8	14	19	5	8	26	12	120
J. Dufty and Sons ...	12	8	1	6	11	14	17	5	7	22	16	119
O. H. Roediger ...	12	7	1	4	11	10	12	5	7	26	20	115
Geo. Crouch ...	14	8	1	9	10	12	14	5	4	21	10	108
John Bond ...	12	7	1	5	8	14	12	5	4	22	10	100

Thus it will be seen that Mr. G. Batson, of Haycroft, is first with a total of 122 points; Mr. W. Sanders second with a total of 120 points; and Messrs. John Dufty and Sons third with 119 points.

The closeness to which the points total indicates the extreme difficulty in arriving at a definite conclusion.

JUDGING MR. BATSON'S CROP FOR WEEDS.

The points laid down by the Society answer the purpose for which they were intended admirably. One small addition might be made with advantage; that is, points to be allowed for experimental work. With the great variations in the different soils it is necessary that every farmer should carry out experimental work on his farm according to the means at his hands; not only to find out the nature of his land, but also to know what plants are suitable to that particular soil. Where horses and machinery are available it does not entail a great deal of time and labour. Then, again, on most of the large farms the farmers' sons do the work, and experimental work is not only interesting, but has a good educational influence on lads who will naturally follow in the footsteps of their fathers, and although many farmers have succeeded and become prosperous, they feel that had experimental work been carried out by them, many losses sustained would have been averted.

It may be of interest to make a few notes on two or three of the highest points obtained in each item.

(A) THE BEST SYSTEM OF CULTIVATION, ROTATION, ETC., PURSUED ON EACH FARM INSPECTED.

The points in this item run out very evenly, as the farms visited have all adopted an up-to-date system of cultivation and rotation, viz.—fallowing the land deeply and well, pulverizing the soil during the spring and early summer to kill all weeds, &c., and also to conserve moisture for the coming crop. The rotation is carried out by growing a wheat crop, followed by oats, then grazing for two or three years. I find Mr. Batson has worked in barley and rape as rotations, and has also sown Italian rye grass on several wheat fields to provide a variety of feed for sheep amongst the stubble, and an early green bite after the first autumn rains. Mr. Crouch works his rotation much the same as above, and gives special attention to his fallow, which was in perfect condition; his crops also show the effect of good cultivation. These two competitors have received the highest number of points in (A).

(B) THE BEST SYSTEM OF MANURING THE LAND, NAMES OF MANURES, AND QUANTITIES USED PER ACRE.

The points obtained are evenly distributed, as the general method is to apply phosphate manures by means of the drill at rates varying from 40 lbs. to 56 lbs. per acre. On one farm I noticed a strip that was left unmanured the width of a drill and a few chains long, and the effect was remarkable, a difference of two or three bags per acre. The application of stable manure to the poor and sick patches of land has proved very beneficial, and should be generally adopted on all farms in the Wimmera, as it is these patches of hungry land that reduce the average yield of a paddock, and again these patches appear to facilitate the growth of weeds such as the white everlasting. It was very interesting to know that farm-yard manure when properly applied has a good effect, as the experience in some of the dry districts was that farm-yard manure left no manurial effect on the yield. From information gathered the best results are obtained from applying the manure directly before fallowing and ploughing it under.

(C) THE BEST SYSTEM OF SAVING STABLE AND OTHER MANURE ON EACH FARM.

In all cases but one the manure was simply carted from the stable and tipped into a heap to be scattered about by the fowls, wind, &c. Some of it is saved certainly, but it is not done systematically. Mr. Batson here stood out alone as being the only one who attempted to save his manure, so that the full advantage of manurial effects was given to the land on which it is applied. A glance at the neatly trimmed, squarely built, heap of well-rotted manure showed at once that the owner placed a high value on the refuse of the farm. In hot dry climates, such as the Wimmera, the pit system of saving manure is preferred. This can be made cheaply, and would repay well the outlay by saving extra waste, and also assisting the decomposition by retaining the moisture throughout the summer.

(D) THE BEST AND CLEANEST GROWING CROP.

The crops on the whole were good, the fallow paddocks showing out distinctly against those ploughed in on stubble, again demonstrating that fallowing, combined with the drill and phosphatic manuring, is the only sure way to obtain a good clean crop. In spite of the careful cultivation, eating down with sheep, &c., a sprinkling of wild oats can be seen nearly everywhere. These may have their advantages providing a farmer can keep them sufficiently under control to grow a fairly clean crop for two succeeding years; for with the advanced methods of combining sheep and wheat growing, the farmer must keep in view the provision of feed for his sheep, and as wild oats thrive naturally on the dark lands of the Wimmera, where the natural grasses do not adapt themselves very readily

MR. G. CROUCH'S 180-ACRE PADDOCK OF WHEAT.

after cultivation, the farmer is forced to admit that good provender is provided where it otherwise would be almost bare of vegetation. In wheat crops Mr. Dufty has carried out an experiment worthy of notice on a 160-acre paddock. The land is of a sandy loam nature, and has grown a crop of wheat for six successive years—each year the returns were good. This season a crop of wheat will give a return of about 1½ tons per acre of good clean wheaten hay. I merely mention the above as an experiment, but would not approve of the system of continuous cropping, as it exhausts the land to such an extent that it takes years to recover again. Mr. Crouch gains highest points in this item, his crops right through were good. A small lot of Calcutta oats had a fine appearance, the ears being long and heavy. More attention might be given to this oat on account of the feeding value of the straw, which is sweet and greatly relished by stock, and would serve well as a stand-by in years of drought. Mr. Batson's 100-acre paddock of Algerian oats was the best I saw in my travels; his wheat and barley also looked well.

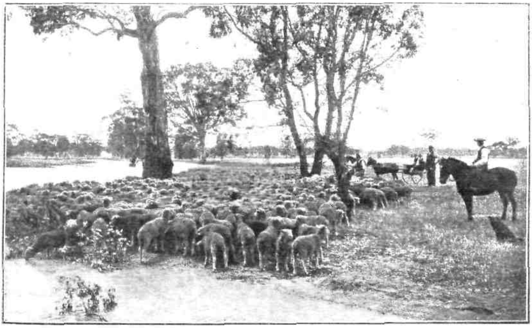
(E) THE BEST SYSTEM OF FALLOWING AND WORKING OF FALLOW.

This is rather a difficult one to determine on points, as the farms extend over an area of about 50 miles of country, the land varies considerably, and what would be considered a good ploughing in one is the reverse in

another. In one district 6 inches deep may be turned over with advantage, while in another district $4\frac{1}{2}$ inches is deep enough on account of the raw crude clay underneath. Then again mallee land does not require the after working that the heavy black land gets with success. The great object is to conserve moisture, and with a fine tilth on the surface a greater amount of moisture is retained. There is one particular point that all were unanimous on, *i.e.*, "that the fallow must not be deeply worked during the hot summer months, but a light surface harrowing should be given occasionally." I may state that on all the farms visited the fallow land was in good condition, showing that the farmers are bringing to bear the results of past experience with great force, and I trust will keep on improving their methods.

(F) THE BEST AND MOST PROFITABLE CLASSES OF STOCK KEPT ON EACH FARM.

I was surprised to find the excellence of the stock on most of the farms, Messrs. Dufty and Sons, and Sanders especially—the former with their



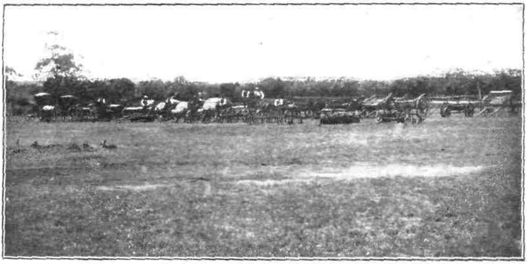
MR. W. SANDERS' HIGH-CLASS MERINOS.

well-set Clydesdales, and the latter with his high-class sheep. These gentlemen deserve great credit for the way in which they have brought their stock to the pitch of excellence, and it is a boon to a district to have such men to provide studs for the surrounding country. Mr. Bond also has the nucleus of a very useful sheep for the present day, "Shropshires," and has raised the standard of his flock considerably by selection and judgment. In giving points for stock, I have considered them as a whole, and it is this that has brought up the points of other competitors, although I admit that horses and sheep are the two main classes of stock for profit in the Wimmera, but to make farming a profitable industry it must be mixed, and to those who have laid themselves out to raise cattle, pigs, and poultry, I cannot help giving them due credit by the way of points. Poultry, though despised a good deal in the past, is making rapid strides as a profitable adjunct to the farm, and when a farmer with a

family tells me that the returns from his poultry have covered all his expenses at the general store it is high time attention should be given to this industry. The Wimmera appears to suit the rearing of poultry, as those seen by me were both healthy and robust. With cheaper freights and a better system of transporting the live stock long distances, such as from Nhill to Melbourne, I am quite sure farmers will give poultry greater attention.

(G) THE BEST IMPLEMENTS AND MACHINERY ON EACH FARM.

The implements and machinery were up to date according to the requirements of each farm. It depends on the area cultivated as to what machinery is required, harvesters being the latest improvement, were given points in preference over strippers. One machine I would like to see used more extensively is the seed grader. There is no doubt that by grading seed, the quality of the crop generally is improved, the plants being more "even," robust, and healthy. It consequently gives better returns.



MR. SANDERS' IMPLEMENTS AND MACHINERY.

Grading machines on the market might be improved considerably. I noticed the scarifier-tyne harrow is being generally used in breaking down fallow to a fine tilth. This implement does its work well and is to be recommended.

(H) THE CONDITION AND SYSTEM OF FENCING.

The fences in all cases were posts and wire in fairly good repair, and as the old fences become dilapidated they are replaced by new ones with a barb and 5-wire. This makes a good substantial fence. In giving points I took gates into consideration. A gate in good repair is an acquisition on a farm, it saves time, labour and often needless expense, especially when barb wire entanglements are hung as a trap for some valuable animal to be caught in, and severely lacerated. I would advise others to note the new gate Messrs. Dufty and Sons are adopting on their farm. It is cheap, easily and quickly made, serviceable and durable. Good fences and good gates well hung give to a farm a good appearance.

(I) THE BEST KEPT KITCHEN GARDEN AND ORCHARD.

You will notice the points vary in this considerably. In allotting points I have taken into consideration—(1st) The usefulness of the whole garden

in providing fruit and vegetables for the family table; (2nd) the manner in which it is laid out, cultivated and kept; (3rd) its appearance in enhancing the beauty of the homestead. I have given full points to Mr. Batson, as he has a variety of fruits in the orchard, grapes in the vineyard, and a good collection of the different varieties of vegetables; I might state that he is the only farmer in this section who has made provision for a good supply during the summer months in a systematic way, which is important. The old winter and spring bed was just about finished, but in another large bed, long rows of fine healthy vegetables were coming on for the harvest time, when they are most required, and are appreciated to a greater extent when taken fresh from the garden. This garden was well cared for both in cultivation and pruning. In the front of the house flowers flourished with creepers climbing over and around the old home, with here and there trees and shrubs as shelter.

MR. G. BATSON'S VEGETABLE GARDEN.

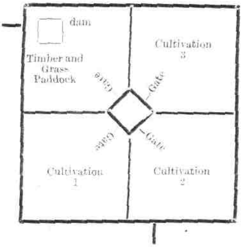
I would like to say a few words in praise of Mr. Roediger's beautiful flower garden and fernery. It takes a good deal of imagination to think that away on the border of the "Mallee," such a garden can exist, and had I not seen it with my own eyes would not have believed it. It is an object lesson to others what may be accomplished with water in such a climate, and also the possibilities of the Wimmera should irrigation come about. Mr. and Mrs. Roediger deserve the highest praise for what they have done, and when we have more homes of this kind, young men and women will be less likely to leave them and make for the cities. Messrs. Sanders and Dufty and Sons had very fine orchards well kept with a variety of fruits.

(J) THE BEST PROVISION FOR WATER SUPPLY.

This in a dry climate is a very important factor on a farm, and considerable expense has been entailed in providing sufficient water, and having it convenient for stock at all times. I was struck with the fine arrangements made for water supply on some of the farms. Large dams and wells have been sunk, windmills and tanks erected to convey the water to the farm yard, house, and garden, and everything done to lessen the

inconvenience of a country with a light rainfall. Messrs. Roediger and Sanders have gained highest points in water supply. The former by sinking a well has obtained, I might say, an unlimited supply of water, which is raised by a windmill, and run into a series of large troughs, each containing 600 gallons. These troughs admit stock from each side, or rather from two different paddocks. Another windmill raises the water from a large dam for house and garden purposes. This grand supply of water with conveniences right at the homestead, which is situated in a fairly central position of the farm, gained points in Mr. Roediger's favour. The water supply of the back paddocks is from another well and a large dam. The drinking and house water is conserved from the roof into tanks with a catchment capacity of about 6,000 gallons. Mr. Sanders has a very extensive and a naturally good supply of water in the shape of large dams, studded here and there right throughout his whole estate, which materially assists in the subdivision of stock into small lots when they do better. Mr. Sanders informed me the number of dams on his place is 22. The farm yard and garden are plentifully supplied by a windmill, and the house from a cement underground tank.

So that one dam may serve either of four paddocks, Messrs. Dufty and Sons have adopted the following plan:—

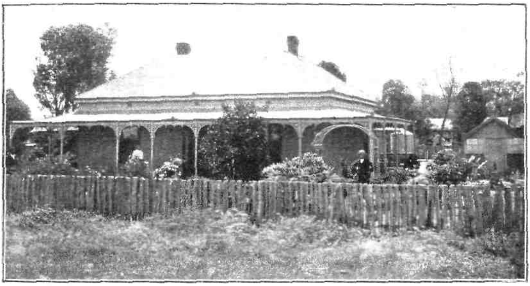


A handy yard is provided, fencing saved, and an outlet to water where required. Should either 1, 2, or 3 paddocks be under crop there is still an outlet to the other three paddocks.

(K) BEST ARRANGEMENT AND SYSTEM OF DWELLING HOUSE.

In this Mr. Roediger stands out with full points. His magnificent house with an avenue of trees leading up to it, and a break-wind of sugar gums, planted four deep on the west side, together with a beautiful flower garden, with here and there an orange and lemon tree, imbues a person on entering with the idea that here at least is a home where taste and neatness are practised. The house itself is well laid out, roomy where required, with a large kitchen and handy appliances. The outer buildings comprise a good cellar, store-room, wash-house, &c. In the farm yard are a good 17-stall stable and loose-box with handy feeding arrangements along the front of the stalls. The whole stable and chaff-house is enclosed with a fowl-proof fence. Wool sheds, machine sheds, granary,

piggery, fowl-house, and men's accommodation comprised the farm yard. The whole plan of the homestead is compact, and yet roomy enough to allow work being carried out expeditiously. Messrs. Dufty and Sons, who came second in number of points, have also a very fine homestead,



MR. O. H. ROEDIGER'S HOME AND GARDEN.

well laid out for convenience. Open large sheds, stables, and loose-boxes are scattered round an open yard, and strong railed fences indicate that horses are bred and yarded up in large numbers. Tree planting as a break-wind is a feature of Mr. Dufty's farm.

BEST FARM UNDER 640 ACRES AND OVER 100 ACRES.

In this section there were only three competitors, and the points allotted to each are as follow :—

Maximum points ...	15	10	5	10	15	15	20	10	10	30	20	160
Name	A	B	C	D	E	F	G	H	I	J	K	Total.
E. Hoffmann ...	14	6	2	9	15	12	16	9	8	26	18	135
W. T. Symes ...	14	7	2	9	13	12	16	6	7	28	12	126
C. Hensleit ...	14	8	3	8	14	10	12	9	7	20	10	115

It will be seen by the points that Mr. Hoffmann gains first prize; Mr. Symes, second; and Mr. Hensleit, third.

Mr. Hoffmann shows a splendid example of hard worl combined with neatness—"a place for everything and everything in its place." It rather surprised me to find that a young man, single-handed practically, fallowed 200 acres of land and harrowed it twice, at the same time keeping the various other branches of the farm going. Any one visiting this farm would do well to note the condition of everything about the place. It speaks volumes for the enterprise and work performed by this gentleman. Mr. Hoffmann has a nice plantation of trees as a break-wind—the hedge at the foot of the garden neatly trimmed and in keeping with the surroundings. The house and farm buildings were all in good order and laid out

to advantage. The horses were useful kinds for farm work, with a couple of brood mares. The cows were ordinary, and were being crossed on to an Ayrshire bull. Sheep, good crossbreds. Lambs sold as freezers. The poultry have received some attention, and I have no doubt gave good returns. I noticed proper accommodation was made for them, instead of allowing them to roost here, there, and everywhere. The crops showed the effects of good cultivation and rotation. One piece of new land was unmanured, the balance manured with about 56 lbs. super., and a very fair crop of wheat is the result. Fences were good, with a number of new cyclone gates well hung. These give the fencing a good appearance and enhance the value of the farm. Water conservation had not been overlooked, two large dams and a windmill supply the farm yard and garden—underground tank for house supply. The kitchen garden was well stocked with vegetables. There were also a few experimental plots of linseed, wheat, &c. Altogether it is a good farm.

MR. E. HOFFMAN'S 120-ACRE PADDOCK OF WHEAT.

The other two competitors have excellent farms, and deserve credit for their work. Mr. Symes, I understand, has sold his place, and is leaving after harvest. This accounts for the want of a good stack of hay, straw, &c., that forms such an important part as a stand-by against years of drought. Every farm should have its stack of hay, straw, and ensilage. Dry seasons have occurred in the past, and as surely will come again. I cannot close this report without saying a word in commendation of Mr. Hensleit's farm, which in a few years time will be amongst the leading places. His homestead on rising ground in a central position of the farm lends itself to becoming one of the best laid out farms visited by me, and when the new house, with its orchard and improved water supply is accomplished, this farm will stand out as being unique in its neatness. I wish Mr. Hensleit and his family every success.

WHEAT CROP COMPETITION, 1905.

In this section fourteen competitors entered the field, one farmer, however, withdrew his crop on account of it bcoming tipped with the hot winds.

After due consideration in the various points, I have placed them as follows:—No 1 being first prize, No. 2, second, and No. 3, third, and so on in rotation.

Name of Competitor.		Cleanliness of Crop	Trueness to Type and Character	Evenness of Crop	Freedom from defects, Smut, Rust, Bunt, Whiteheads	Apparent Yield	Totals.
Maximum points	...	20	20	15	15	30	100
Geo. Crouch	...	17	15	14	12	28	86
H. A. Dahlenburg	...	18	15	12	12	27	84
G. Landers	...	16	12	14	13	26	81
A. Schultz	...	12	12	14	12	25	75
Henry Scroop	...	14	12	13	12	24	75
W. Sanders	...	14	12	12	13	22	73
R. Ervin	...	15	12	10	10	25	72
John Bond	...	12	11	13	12	23	71
P. C. Chiappini	...	16	11	10	12	22	71
W. Pohlner	...	12	11	10	10	26	69
J. C. Macdonald	...	12	12	10	12	23	69
J. W. Oldfield	...	15	9	8	10	22	64
D. Duthie	...	10	9	11	12	20'	62

You will notice that in the scale of points adopted by me there are three important factors, viz.: (1) "cleanliness of crop"; (2) "trueness to type and character"; and (3) "apparent yield." In judging, I have paid particular attention to the second, "trueness to type and character." I take it that the aim of the Society in these competitions is education and improvement in the methods of wheat growing, and as the standard of cultivation has arisen considerably within the last few years, the next great requirement is to raise pure seed. Then, again, a farmer winning the prize in such an important competition thereby has his wheat advertised very widely, and being situated in the Wimmera, one of the best wheat-producing districts in Australia, it follows naturally that farmers from other parts will inquire for seed from a first prize wheat crop, and to provide seed with any degree of success it must be pure in every respect. I think the Society would do well to bear this in view and formulate a scale of points for judging wheat crops, and each succeeding year raise the number of points in this particular item, or in any other way offer inducements to competitors to raise the standard of quality and purity in any varieties grown by them. It is reasonable to admit that the farmer who can produce the largest quantity receives the highest returns, but unless that same farmer pays attention to his seed so surely will his yield gradually decrease and the quality of the grain deteriorate, or run out. So that if the Society will make for its aim, the combination of raising pure and typical varieties with the maximum of production, it will benefit not only the local district, but the whole farming community.

In judging the wheat crops, I was placed at rather a disadvantage, the season being exceptionally late. It follows the crops are backward and altogether too green to make comparisons as to how the grain was filling, and in estimating the apparent yield. However, all the crops examined were much alike in this respect, so that each competitor is placed on a fairly equal footing. The crops right through are good; in fact, much better than anticipated by me. There is not the least doubt that the Nhill and surrounding district is admirably adapted to wheat growing, combined with sheep raising. The high standard to which wheat growing has been brought is due, no doubt, to artificial manuring and the drill, together with a good system of fallowing; then later sheep were used for feeding off, at the same time supplying the want of a certain amount of nitrogenous manure. To-day the trade in freezers has made sheep a very substantial adjunct in the returns of the farm. This system might be called the bare-fallow sheep system of farming. When we have advanced still a step further and can grow a green covering on the fallow and stubble land to provide a bite for the sheep, and at the same time add the want of humus so necessary in conserving the moisture during the hot summer months, even better results will be achieved. This system of rotation will also supply the necessary proportion of nitrogen required to stimulate plant growth. It is well understood by all up-to-date farmers, that a variation in supplying the plant food must be adopted in the near future to keep the land in that state of freshness in which we found it when selecting 30 years ago.

For the benefit of those interested, I will make a few comparisons to show how points were obtained in several of the leading crops. No. 1, Mr. Crouch. This is a very fine crop, its chief characteristic being "fairly pure," "even," "well headed," and "clean," the apparent yield being estimated at fully six bags per acre. When it is considered that there were over 300 acres of fallow under wheat it shows that Mr. Crouch adopts some good principles in working his land and crop rotation. Mr. Crouch's fallow land is ploughed 5 inches deep, and is cultivated repeatedly to a depth of 3 inches with the harrow scarifier-tyne implement. This is done during the spring and early summer; the paddock is then left to sheep to do the rest throughout the summer. Fifty lbs. of seed per acre were used for sowing, and 40 to 45 lbs. manure (superphosphate). The whole of the crop was eaten off by sheep in the early winter. Varieties grown, Purple Straw and Dart's Imperial. No. 2, Mr. H. A. Dahlenburg, also has a good crop, and the undulating nature of the country gave a very pleasant view of a wheat field. This crop was beautifully clean and gained a point in this over No. 1, but lost two points in evenness, as it did not have that fine table-top appearance as in No. 1. No. 2 crop was fairly pure to type and character of the variety sown, but not what I would like to see in a crop securing a prize in this competition. The estimated yield was slightly under six bags average per acre, but weather conditions may alter this considerably. Mr. Dahlenburg sowed 50 lbs. seed per acre, with about 50 lbs. superphosphate. This crop was also eaten off bare with sheep in the winter. Varieties grown, Marshall's No. 3 and Dart's Imperial. No. 3, G. Landers, Salisbury. This is a very neat little lot of 120 acres. Points were lost in the cleanliness, as a few wild oats showed up here and there. The impurity of seed was more noticeable than in No. 2, but in evenness it pulled up considerably, also gained a point in freedom from defect, there being but very few white-heads

showing. This crop was sown thicker than any visited by me. In estimating the yield I was of the opinion that it would not fill so well on account of the heavy seeding. 60 lbs. seed sown per acre, with 50 lbs. manure (superphosphate). Crop not eaten off. Varieties, Australian Talavera and Purple Straw. No. 4, Mr. A. Schultz. It was a pity that such a fine crop was marred by weeds. Barley grass, poppy, and iron weed showed throughout this paddock to its detriment, and the purity was not quite so good as in the three former. I considered the yield would be pulled down from the effects of weeds. Mr. Schultz is a good farmer, and I would have liked to have seen him higher up in the list. Messrs. Sanders, Ervin, and Chiappini deserve credit for their crops, each one showing some good points. I may state that in all the crops there were signs of "Take all" showing in patches. Smut I saw in only one case, but it was rather early to detect fungus diseases, such as smut and bunt.

WEEDS THROUGHOUT THE CROPS GENERALLY.

Wild Poppy (*Papaver rhœas*). In passing through the crops I could not help noticing the rapidity with which the wild poppy has spread over the country. It is said to have first appeared after the heavy wind storms in 1902—the drought year. Unless some means of coping with it are taken it will mean a serious reduction in the average yield, as a plant with a fine penetrating tap root and heavy foliage must absorb a fair amount of nourishment and moisture to sustain itself, and this means robbery to the wheat plant. Smothering by growing oats may kill it. Harrowing or working the land lightly after the crop is well established should kill the young poppy plant by uprooting and burying under the loose earth. There is always the chance that it may propagate so rapidly as to kill itself by overcrowding and smothering. The seed is very minute and is easily carried by wind from one paddock to another, so that it is useless for one farmer to eradicate it, and his neighbour allow it to grow and ripen. Every one must do his share in this direction.

Iron Weed or Sheep Weed (*Lithosperum arvénse*).—This weed has been known for some considerable time, and makes its appearance at various periods in cultivation paddocks when conditions are conducive to its growth. Sheep keep it down in its early stages of growth, but later the stems dry, and it appears almost like a piece of wire, interfering considerably with harvesting machinery.

White Everlasting (*Helipterum corymbiflorum*).—This small daisy-like flower is a fierce feeder on the soil, and when once established subdues the wheat crop considerably. It grows generally on the poor hard patches where crop is thin. Fallowing and cultivating well to prevent seeding, or keeping the land in good heart, seems to overcome this weed to a great extent.

Pimpernel (*Anagallis arvénsis*).—This small weed is spreading on cultivation land in the Winiam district. It has proved a great pest in the more humid districts of Victoria, but I do not think it will make much headway in the Wimmera.

Wild Oats (*Avena fatua*).—This is an old friend, and was fairly prevalent on some of the farms, but as it provides a certain amount of good feed some of its bad qualities are overlooked. In fact, I may be wrong in classing this amongst the weeds, and will merely say "a plant out of place" when in a wheat crop.

In concluding my remarks concerning weeds, I would just draw attention to the fact of a very pernicious weed growing on the railway line at Nhill, and would advise that steps be taken to have it rooted out before flowering each year as it appears. It is known as Hoary Cress (*Lepidium draba*).

In conclusion, I would like to say that the Nhill Agricultural and Pastoral Society is working on the right lines for the advancement of agriculture, and trust it will get every assistance both from kindred associations and from the Government, through the Agricultural Department, not only in these farm competitions but in furthering experimental work. It is understood that a very large proportion of experimental research is carried on by scientists, working with costly apparatus and a carefully planned method which extends over a series of years. But of what use is all this work unless applied practically to the farm. And it is here that agricultural societies could be of advantage in bringing the scientist and his work within reach of the farmer. One of the greatest discouragements a farmer has to contend against is that scientists generally speak and write in a language almost unknown to him, and to overcome this difficulty there is but one way, and that is for the farmer and scientist to meet half-way and exchange ideas. In travelling through the different districts I noticed there was a general eagerness for information on improved methods of agriculture, showing that the farmers were fully awake to the fact that to keep pace and compete with other countries we must apply the latest improved ideas in our methods of agriculture.

Before concluding my work, I wish to thank all those whom I visited, and those with whom I was brought into contact, for their kindness and hospitality. I found in all instances that I derived beneficial information in conversing with the various farmers on agricultural topics, and trust that opportunities may arise in the course of time when acquaintances will be renewed. To Mr. Towns, your energetic secretary, I owe many thanks for the expeditious manner in which he carried out the various undertakings. The whole seven days' work was done without a hitch and was always arranged so that sufficient time was given to thoroughly investigate each and every lot competing. Owing to the tact shown by Mr. Towns in getting to work without loss of time on arrival at the different places, the task of judging was considerably lightened.

MR. H. A. DAHLENBERG'S DRAUGHT STOCK.

SURVEYING ON THE FARM.

A. S. Kenyon, C.E.

Levelling.

THE MINER'S TRIANGLE.

So far attention has been confined to horizontal measurements. The earth's surface, however, is not very smooth, and vertical measurements, especially with regard to irrigation and water supply, roads, and drains are essential. The ascertaining of slopes and the relative levels of points, is called levelling. Here instruments are essential. A primitive, yet handy, contrivance is known as the "miner's triangle." It is formed of battens about 3 inches by 1, made in the form of the letter A. (See Fig. 17.) The slant pieces are made exactly equal in length, and the cross-piece is fixed to the slant arms at equal distances. A plumb-bob is suspended from the point, and hangs a little lower than the horizontal piece.

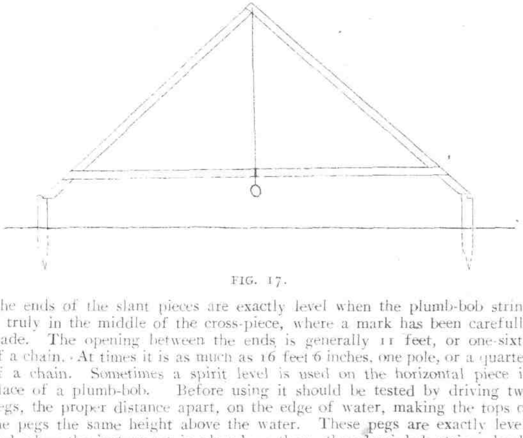


FIG. 17.

The ends of the slant pieces are exactly level when the plumb-bob string is truly in the middle of the cross-piece, where a mark has been carefully made. The opening between the ends is generally 11 feet, or one-sixth of a chain. At times it is as much as 16 feet 6 inches, one pole, or a quarter of a chain. Sometimes a spirit level is used on the horizontal piece in place of a plumb-bob. Before using it should be tested by driving two pegs, the proper distance apart, on the edge of water, making the tops of the pegs the same height above the water. These pegs are exactly level, and when the instrument is placed on them, the plumb-bob string should be exactly on the mark, or, if a spirit level be employed, the bubble should be dead centre. If not, the necessary corrections should be made. To set out a drain or grade line of any kind, adopt a particular fall, say, ½-inch per chain. Then, if the opening of the triangle be one-fourth of a chain, cut a step in the pegs of one-eighth of an inch in height, as shown in the figure. One leg of the triangle is placed on the starting peg, and another peg driven in under the other leg until the string or the bubble shows that it is level. On the next setting-up, the back leg is placed on the

cut step, and so on, so that the step in each peg is $\frac{1}{8}$-inch lower than that in the peg immediately behind it. The triangle is rather slow in use, and is only of service for levels along one line. Contouring of catchment areas or of irrigation paddocks requires a lighter and more generally useful instrument.

THE WATER LEVEL.

The water level is free from the faults mentioned, and may be easily made. About the best form is that shown in Fig. 18. It consists of a piece of water-pipe $\frac{1}{2}$-inch or thereabouts in diameter, with elbows screwed on each end. In the elbows are inserted medicine bottles with the bottoms cut off, and fixed in with plaster of paris or shellac. Short pieces of glass tube, such as steam-gauge glass, will answer the purpose as well. Corks for the bottles or tubes are required. At the middle of the tube, a nut or

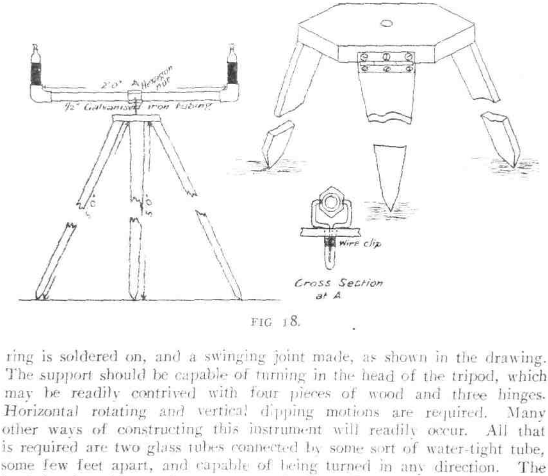


FIG 18.

ring is soldered on, and a swinging joint made, as shown in the drawing. The support should be capable of turning in the head of the tripod, which may be readily contrived with four pieces of wood and three hinges. Horizontal rotating and vertical dipping motions are required. Many other ways of constructing this instrument will readily occur. All that is required are two glass tubes connected by some sort of water-tight tube, some few feet apart, and capable of being turned in any direction. The level is given by pouring water, preferably coloured black with a little ink, into one end until it fills the connecting tube, and shows in the glass at the other end. A line sighted along the tops of the water in the glasses will be truly level. To shift the instrument, the corks are put in the glass ends, and the whole thing may be carried without risk of spilling. When setting up again, the instrument is set as nearly level by eye as possible, and one cork taken out. The water will not, however, move until the second cork is extracted, which is done very carefully. Sighting may then again be done. Before rotating the instrument, it is well to put

in one cork. An extra supply of coloured water should be carried in case of an accident. There is also required a staff 10 feet long, or more if practicable, marked off in feet and inches, made from a 3-inch by 1-inch batten. (See Fig. 19.) A cross-bar, blackened, with a box guide, formed

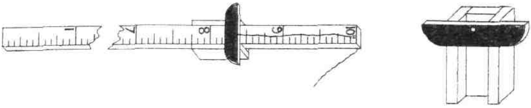


FIG. 19.

as in the drawing, slides up and down the staff by means of a cord running through a hole near the top, and worked by the man holding the staff. Other instruments such as drainage levels, consisting of a spirit level on a tripod or telescopic levels, are better avoided, as they are liable to get out of adjustment, and, once out, are not easily readjusted by persons unskilled in their use.

LEVELLING OPERATIONS.

The measurements of the levels of the surface, as shown by the readings of the staff, are really measurements downward from the level line along the tops of the water in the glasses to the ground. (See Fig. 20.)

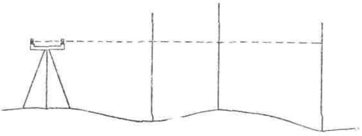


FIG. 20.

Consequently the lower the ground surface, the greater is the reading. An increase in the reading as the staff is shifted shows a fall, while a diminution shows a rise. In operation, set up the level where a clear view can be obtained of all the points required, or as many of them as possible; it need not be on the line or any place in particular. Direct the tube at the starting point. Remove the corks after having brought it nearly level, and sight the staff held by the assistant. He will move the cross-bar up or down, as indicated, until its top is in line with the water surfaces. He will then note the reading of the cross-bar, or call it out to the observer at the instrument, as arranged. The staff is then taken to the new position, and another reading obtained. This is repeated until the staff is getting too far away for accurate sighting. The staff-man should then select some good fixed point, such as a stump, stone, or even a piece of hard ground, and hold the staff on it; it need not be on the line, nor a point of which the level is required. When the observer has taken the reading, the staff-man does not move, but waits until the observer has shifted the instrument to a new position, and taken another reading of the staff at

the same point. The staff-man then proceeds to the next point, the level of which is desired. The notes of the work should be kept, as shown in the following example:—

Distance.	Reading.	Rise.	Fall.	Surface Level.	Bed level.	Cutting.	Notes.
0	5' 6"	...	...	100' 0"	98' 0"	2' 0"	Dam bank.
50 links	6' 3"	...	0' 9"	99' 3"	...	1' 3"	
100 "	4' 2"	2' 1"	...	101' 4"	97' 11"	3' 5"	
150 "	4' 0"	0' 2"	...	101' 6"	...	3' 7"	
200 "	3' 9"	0' 3"	...	101' 9"	97' 10"	3' 11"	
	2' 9"	1' 0"	...	102' 9"	...	...	On stump.
	3' 2"	...	...	...	...	...	
250 "	4' 7"	...	1' 5"	101' 4"	...	3' 6"	
300 "	4' 9"	...	0' 2"	101' 2"	97' 9"	3' 5"	

In the first column is noted the distance along the line at which the reading is taken. In the second, the readings themselves are put down. When a change is made a horizontal line is drawn under the last reading noted, before moving the instrument, that is, the reading of the point at which the staff is to be read twice. The third and fourth columns are then filled in by subtracting a reading from the one next to it. When the second of two readings is the bigger, there has been a fall in the ground, as already explained, and *vice versâ* there is a rise when the first reading is the greater. In the case of the two readings separated by the horizontal line no subtraction is made, as these, being at the same point, and of course at the same level, cannot consequently show a rise or a fall. If the level of the surface at the starting point, 0 links, is not known, it is customary to commence the fifth column with 100 feet, that is to assume, for the purposes of comparison, that the surface level at 0 links is 100 feet. The surface levels at the other points are found by subtracting the falls and adding the rises, as shown in columns 3 and 4. Columns 6 and 7 have been added to show the application of the results thus obtained to a case of draining. In the sixth column, the bed levels of an assumed channel are set down, the channel having a depth of 2 feet at the start, and a fall of 1 inch per chain. The differences between these bed levels and the surface levels in column 5 give the depths of cutting required. In the last column any notes or remarks which may be required to make the figures clear and intelligible are put down. By running lines at right angles to a base line, the whole of a paddock, or any area, may be levelled, or, as this operation is termed "gridironed." Catch drains running on the contours, that is, the lines of equal level, check banks for irrigation, also preferably on contours, or drainage channels at right angles to the contours, may then be located and set out. Should a line require to be run with a tolerably uniform cutting with a known gradient or fall, the staff-man, after the first reading is taken, raises the cross-bar the required fall for one chain, say, ½-inch, and paces out a chain in the probable direction. If the reading is exactly on the cross-bar, the cutting at this point will be the same as at the starting point; if it be not upon it, the cutting will be more or less, and the observer must decide whether it will be worth while shifting the staff—and the line of channel—to save the extra amount of cutting or bank shown. The cross-bar is then raised another ½ inch,

giving again a fall, and another chain is set out. The observer must use his discretion as to the extent shortening the line will compensate for extra earth work.

Boning Rods.

Boning rods are often of use in grading a section of ground—such as the bed of a channel or surface of a road—between two points whose levels are given and which are not too far apart up to, say, 5 chains. A set of three is required, all equal in length and made T shaped, as shown in Fig. 21, and out of, say, 2-in. by 1-in. soft wood. The main points

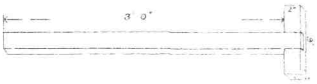


FIG. 21.

to be borne in mind when making the rods are—first, make all the rods the same length; second, get the cross-head truly square to the blade; third, make the top or sighting edge of the cross-head as straight and sharp as possible. The method of using the rods is shown in Fig. 22. ACDB is

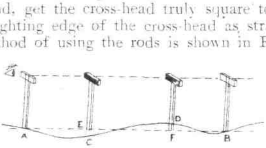


FIG. 22.

the section of a portion of a road bed it is desired to grade, A and B being points whose levels are known. It is desired to fill in or trim off the ground between A and B, so that the grade in the line joining them will be uniform. The operation proceeds as follows:—One assistant places his rod vertically at B, while the observer places his eye just behind the top edge of his rod held upright at A. A second assistant holds the third rod at the point C. He raises the rod until its top edge is in line with the sighting edges of the rods at A and B, as seen by the observer's eye. The rods all being of equal height, the bottom of the rod at C is therefore on the true grade line between A and B. A peg is driven in with its top flush with the bottom of the rod. Similarly the ground is dug away at, say, D, until the top of the rod held there is, as before, in line with the tops of those at A and B. A peg is also put in at this point. By these means, the grade line can be established at any number of points between A and B, as close as required. It is, of course, obvious that the rods must be held truly vertical to insure good results. For short sights no special trouble need be taken to prepare the sighting edges of the rods. For long ones, however, the best results are secured by whitening the cross-head of the far rod and holding it against a black background. If the cross-head of the intermediate rod be blackened, the two edges can be brought quite sharply into line with the sighting edge of the rod at the observer's end, and, on a clear day, sufficiently good work may be done up to distances of 8 to 10 chains.

A HINT FROM GIPPSLAND.

A. W. Curlewis, District Inspector of Stock.

The past year has proved beyond question that the matter of feeding should receive the earnest attention, in South Gippsland at least, of farmers who desire to make a permanent success of dairying. Through want of early autumn rains in many parts, there was very little growth of grass before winter set in. The latter part of the winter was unusually severe, and the spring unprecedently late, with periods of extremely cold, rough weather. These various causes have contributed to heavy losses of stock on the part of farmers who had no back country, and were not in a position to hand feed liberally. Probably the value of dairy cows which died through insufficiency of feed throughout Central and South Gippsland was from £50,000 to £60,000, and great numbers of those which survived and calved early, were not in condition to milk profitably. To a great extent this loss would have been avoided by hand-feeding properly, as was proved on those farms where it was practised, as shown by the few examples cited below.

Mr. B., of Poolman's Track, lost 22 cows out of 50; Mr. H., same locality, lost 10 cows out of 18; Mr. C., Allambee East, lost 16 cows out of 35, and Mr. D., Allambee East, lost 15 cows out of 40. These owners spent from £25 to £40 each in the purchase of chaff in an endeavour, when too late, to save their stock. Carriage on chaff was 2s. 6d. from railway station—10 to 14 miles distant. Others succeeded in saving their cows at an expenditure of from £40 to £100 on chaff taken delivery of at railway stations.

Of those who made provision for hand feeding, Mr. A., of West Alberton, cut 20 acres with maize. Fifteen acres of the same land were sown again with barley as the maize was cut. He also put in three acres with pumpkins for the pigs. On 315 acres of land, Mr. A. kept throughout the winter 125 cows, 20 young cattle, 16 horses, 80 pigs, and 100 ewes. The latter lambed in May, 100 per cent. of lambs being marked. No stock were lost, and the cows milked through the winter were in splendid condition. Mr. A. assured me that the cost of cultivation, after the land was cleared, was practically *nil*. Mr. H., of Yarram, obtained equally successful results from hand-feeding. There are doubtless difficulties to contend with in clearing for the plough and cropping much land in the excessively steep and broken country of which a large portion of South Gippsland consists. On most farms, however, a few acres can be picked out here and there which could be ploughed with a strong team; two or more neighbours might combine forces for the purpose.

Another matter which has been neglected in South Gippsland is water conservation. Although the natural supply from streams and springs is generally plentiful and fairly permanent throughout the district, the necessity of making some provision to supplement this was proved last summer, when, owing to this neglect, a large area of good grass land was rendered comparatively useless. In many cases where the natural supply had not entirely failed, it was so scarce that it became foul and contaminated from the excreta of the cattle, and through being puddled up by them. If all land-owners whose properties are not watered by fairly large and permanent streams would have dams or tanks made, springs fenced in,

or wells sunk, and the water conveyed by suitable means into drinking troughs for their stock, they would reap great benefit in dry summers. They would be able to use all their country, and their stock would have a sufficiency of good wholesome water instead of being compelled to hang round muddy pools for hours at a time sucking up filthy moisture.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S.,

II.—GENERAL INDICATIONS OF DISEASE.

HISTORY.

The history of the case, by which is especially meant all ascertainable particulars as observed and detailed by those who have been associated with the animal from the onset of the complaint, is of the utmost importance in forming a diagnosis, if the information received is reliable. The tendency on the part of owners and attendants is to offer opinions on the cause and nature of the complaint, rather than to confine themselves to the relation of facts, which alone are of use to the practitioner. Exaggeration is also commonly indulged in, and it is unwise to place too much reliance on estimates by attendants relating to the breathing, quantities of urine and dejecta, or on matters in regard to which accurate judgment is required. Undue excitement, or a fancied importance on the part of the owner or attendant, generates a tendency to warp the judgment or over-state the facts. Leading questions should never be asked, except when it is desired to check volunteered statements, for oftentimes answers are given with the idea, unconsciously it may be, of anticipating the questioner's thoughts and reasoning, or of acquiescing in his supposed desire. Sometimes answers may be invented, and without the exercise of considerable perspicacity the practitioner may, for a time, be woefully misled. But, in regard to such matters as age of patient, duration of illness, character of food, nature of work, length of journey, exhibition of pain, and like matters of fact, there is little room for distortion, and the evidence can often be independently corroborated.

ATTITUDE AND APPEARANCES.

Observation of the attitude of a patient is always of material assistance in forming an opinion as to the nature of the disease; and, in some diseases, a keen observer may by this means complete the diagnosis without further examination. In pleurisy, for example, the turning out of the elbows and the fixing of the ribs, along with the distressed breathing, are characteristic and pathognomonic. The "stand" in laminitis (founder), with the body swung back, the feet thrown forward, and the weight resting as much as possible on the heels, to avoid pressure-pain at the front of the foot, can scarcely be mistaken, any more than can the "stilty" or "proppy" gait, and the protrusion of the haw of the eye when the head is elevated in developing lockjaw (tetanus). Nausea and dejection are eloquently indicated on the countenance of a sick animal. With a history of several deaths or current cases, a cow seen standing apart from the herd with back

arched, hollow flanks, slightly hurried breathing, and knuckling over on the hind fetlocks may be "specked" as suffering from pleuro-pneumonia.

Other examples of pathognomonic attitudinizing are:—The pressing or banging of the head against a wall in stomach staggers; the double flank heave in broken wind; the disinclination to lie down in acute lung affections; the languidly painful movement in colonitis; the "pointing" of the feet alternately in navicular disease; the S-shaped curve of the cow's neck when lying down in milk fever; the pawing and crouching and painful attitude in colic; the reckless tossing about and kicking the belly, and the anxious looking-round towards the flanks, in inflammation of the bowels (enteritis); the turning in a circle in "sturdy" in sheep; the straining after abortion; and the shivering of approaching fever.

COAT AND SKIN.

Closely associated with the attitude as an indicator of disease is the appearance of the coat. It may be dry, rough, and staring, or moist with sweat in the initial stages of febrile diseases. Profuse perspiration at any time is an indication of a want of balance in the circulation, and if not produced by some obvious cause, such as brisk exercise, it is significant of grave circulatory derangement. Cold sweats succeeding on grave symptoms during acute disease are often the precursors of approaching death.

In sub-acute and chronic derangement of the digestive tract, whether arising from improper food, intestinal worms, calculi, or other causes, the skin is dry, harsh, and scurfy, and the coat faded and sunburnt and devoid of gloss; and in some acute indigestions the presence of nettle-rash spots or "blebs" is the most prominent feature. The distension of the skin with gases in various blood poisonings (septicæmic deseases) is perhaps best exemplified in the inflated (emphysematous) condition of the limbs or quarters, which is a common feature of blackleg or symptomatic anthrax.

Itchiness of the skin, if not due to the presence of lice or other skin parasite, is usually an indication of some irritation of the stomach or bowels, and persistent rubbing of the tail against a wall or post is an almost unfailing sign of worms in the rectum or large bowel. A "hide-bound" condition of the skin suggests a non-thriving condition, and points to the necessity of supplementing the food with some oily or mucilaginous material, like linseed or boiled barley.

APPETITE.

In most diseases, but especially in those of the organs of digestion, the appetite is impaired. Often the first symptom observed at the onset of an illness is a diminished desire for food, or its refusal altogether at the regular time of feeding. Food may, however, be refused without there being any impairment of appetite, when pain is experienced during mastication or swallowing. This often occurs from irregularities, looseness or decay of the teeth, injuries to the tongue, soreness of the gums and lining membrane of the mouth from the irritation of "bearded" oats, for example, or from sore throat.

Mechanical impediment to swallowing by pressure on the gullet of a "strangles abcess," or by choking and inability to swallow through spasm of the muscles of the pharynx, as in lockjaw, or through paralysis, as occurs in acute cases of indigestion and "cripples" in cattle, may also account

for the disinclination to feed heartily. In all these cases, however, there will be evident eagerness for food, but inability to masticate or swallow it comfortably. In the last case there will be a dribbling of saliva from the mouth on to the ground or into the manger, and in cases of choking and lockjaw as much as upwards of half-a-dozen gallons may be so dribbled into the manger during the night. Inability to properly masticate is indicated by the animal "quidding" the food, that is, dropping it in bits from the mouth after it is only partially chewed. Sometimes animals will refuse food that is unpalatable either from mustiness, souring, decay, or other defect; but on the other hand it is surprising what inferior food-stuffs some animals, especially cattle, will consume when they are in health. It is by no means uncommon that disease is caused by owners unscrupulously taking advantage of this "omnivorous" propensity to (as they think) profitably use up inferior and rubbishy feed, the proper place for which is the manure heap.

In non-febrile complaints, the distaste for food is often due to the fact that the stomach or anterior intestines are already overloaded, and when this can be positively determined starvation for a time is wholesome and justifiable. In febrile diseases loss of appetite usually means loss of power to digest food, and this in turn results from the loss of secretive function by the numerous glands along the intestinal tract which normally elaborate the digestive juices; and, until there is a return to the normal activity of function on the part of these glands through the decline of the fever, it is as well to avoid forcing the appetite, and to withhold any but the most easily digested food, such as greenstuff, gruels, mashes, soups, and infusions. Even greenstuff is likely to do harm, except at the stage of commencing convalescence, on account of its liability to ferment if it remains long undigested, and, by the consequent formation of gases, to give rise to flatulence or hoven (tympanitis).

Depraved appetite is manifested, particularly by cattle, in sub-acute and chronic disorders of the stomach and bowels, and is indicated by a desire or craving to chew and swallow such miscellaneous articles as dead rabbits, old boots, slippers, hosing, bits of rope, rags, rusty tinware, hoop-iron, and other such rubbish. The chewing of bones or mortar or sea sand may be taken as indicating the absence of a sufficiency of calcareous and saline material in the soil and herbage; and the practice may be counteracted by allowing access to sterilized bonedust and rock salt.

In cattle, *cessation of rumination* or loss of the "cud," almost always accompanies loss of appetite, and with these animals it is the height of folly to give them any ordinary food until they regain the "cud," except, perhaps, a wisp of sweet hay, which may be given occasionally to act as a "starter" for rumination. The longer rumination is suspended, the more unsuitable for to be ruminated, by reason of souring and fermenting, does the food impacted in the paunch become. To continue feeding coarse food is only to increase the load to be carried, and the amount of unpalatable rumination to be got through afterwards, without any compensatory advantage in the way of nourishing the animal; for such food cannot be completely digested and assimilated until it has been re-masticated.

BREATHING.

The breathing is generally increased in frequency in all febrile and inflammatory diseases, but particularly in acute affections of the lungs. In active congestion of the lungs, the respirations may reach as high as

150 per minute. Apart from *frequency* and *infrequency*, which terms refer to the number of respirations in a given time, the breathing may be quick, as in the painful side "stitch" of pleurodynia, or *slow*, as in brain affections. These latter terms describe the length of time occupied by each respiratory act consisting of an inspiration and an expiration. The breathing may also be *deep* or *shallow*, *easy* or *laboured*, and *unequal* by variation of number of respirations per minute, or *irregular* by differences in time occupied for each single respiratory act.

The number of respirations per minute varies slightly with the kind of animal, and amongst domestic animals it is found that the smaller the animal the more frequent is the breathing. The following table gives the average rate per minute of the domestic animals when at rest in health :—

Horse ...	... 8 to 10	respirations per minute.
Cattle ...	... 12 to 15	,, ,,
Pig ...	... 12 to 20	,, ,,
Sheep ...	... 12 to 20	,, ,,
Dog ...	... 15 to 20	,, ,,

The frequency of respiration and pulse are in ratio of about 1 to 4½. An exception is seen in the cow when ruminating, during which process the pulse is usually increased to 70 or 80 beats per minute, while the respirations remain at or below normal. The ratio spoken of may be maintained during times of acceleration and decrease, even under conditions of disease, but most often it is then disturbed. In bronchitis, for example, the respirations may be as high as 60, 70, or even 80 per minute, while the pulse is only 60.

Abdominal breathing is a term used to indicate that the respiratory effort is assisted to a greater or lesser extent than usual by the action of the abdominal muscles. These muscles, by their contraction, compress the abdominal contents, forcing forward the diaphragm, and so assist in expiration. Abdominal breathing is associated with a distinct heaving of the flank, and is well seen in pleurisy, in which disease the movement of the ribs causes great pain; but this is avoided somewhat when the ribs are fixed and the abdominal muscles brought into play to assist in expelling the air content of the chest. In broken-winded horses, the most noticeable symptom is the double "heave" of the flank, caused by the extra effort of the abdominal muscles to expel the air from the distended air vesicles of the lungs. Conversely, when existing disease is accompanied by pain in the abdomen, as in peritonitis or flatulent colic, the respiratory effort is largely confined to the muscles of the chest (thorax), and the term *thoracic breathing* is used.

Stertorous breathing, or *snoring*, when occurring otherwise than during sleep, is usually associated with diseases affecting the brain. The muscles of the soft palate at the back of the mouth become paralyzed, and allow it to hang pendulous in front of the larynx, thereby impeding the expired air, which, by impinging on the hanging, flaccid mass, causes it to vibrate and emit a subdued rattling or snoring sound. Perhaps the most familiar example of stertorous breathing is met with in the unconscious (comatose) stage of milk fever in cows.

Fœtid breath.—The odour of the expired breath often betrays the use of certain medicinal agents of a volatile character. Over-doses of turpentine, for instance, or its mal-administration through the nostril, may be detected by smelling the breath. In severe cases of pneumonia the fœtidity or

foulness of the breath indicates an adverse change to gangrene or mortification of the lung substance, and consequently increased jeopardy of the patient. The breath is likewise foul in nasal gleet and other suppurative and purulent conditions of the respiratory mucous membranes and their discharges. It is of a particularly sickening character when ulceration of the bones of the nasal passage exists. *Sourness* of the breath is usually associated with stomach derangements, and is more often a result of eructations of sour gases from the stomach than of an exhalation from the lungs.

A *cough* is usually involuntary, and consists of a spasmodic closure of the larynx, necessitating a counter spasmodic and forceful action of the abdominal muscles during expiration, which causes sudden and forcible expulsion of a volume of air, accompanied by marked sound. There are many varieties of a cough, and these, by their character, afford some indication of the nature and location of the abnormality of which they are an evidence. The *dry cough* is met with in the early stages of bronchial affections, before the exudation of mucus has become profuse. When this occurs, the character of the cough changes to the *moist* variety. In pleurisy the cough is *dry, short*, and *painful*, and gives the impression of only a half-completed effort. Roaring is characterized by the *hollow* "graveyard" cough. The cough of asthma, or "broken wind," is dry, short, and feeble, and is sometimes described as a *suppressed* cough. A cough is sometimes present in diseases of the bowels, liver, and stomach— the so-called *stomach cough*: also during the irritative stages of dentition, when the cough is loud and paroxysmal. These "sympathetic" coughs are produced as a result of reflex irritation from the diseased part, and it is well to always remember that a cough does not necessarily mean derangement or disease of the respiratory organs only.

A *grunt* is caused by a narrowing of the larynx, with a continuous forced passage of air through the constructed opening.

VISIBLE MUCOUS MEMBRANES.

These comprise the mucous membrane lining the nostrils, mouth and lips, the conjunctiva of the eye, and, in the female, the inner lips of the vulva. While in health they are usually of a pale-red or carnation colour, due to the normal condition of blood supply, in disease they show distinct changes, which are of great importance, as being always available links in the chain of evidence establishing a diagnosis.

In conditions of debility, anæmia, and wasting disease, the visible mucous membranes are *pale* and *bloodless*, while in febrile and inflammatory affections the natural red colour is deepened to a florid red or deep purple. The term "injection of the visible mucous membranes" is applied to this condition because it depends on the engorging of the small blood vessels with an excess of blood, and it is therefore indicative of a deranged circulation. Sudden *pallidity* of the membranes accompanied by decline of local temperature is indicative of internal hœmorrhage, such as occurs in rupture of the liver. A *rusty red* colour is frequently associated with pneumonia, and a *rusty yellow* colour with diabetes. A *blue* coloration in newly-born animals is a diagnostic sign of the always fatal condition known as "cyanosis." Another common alteration of the membranes is met with in diseases of the liver and kidneys, when they show a varying degree of *yellow* coloration, from the washed-out yellow seen in sheep affected with "fluke" to the deep greenish yellow of jaundice. A *slatey* coloration and sliminess occur in certain febrile diseases of a

slow typhoidal character; and in some transmissible diseases a distinctive change is observed. For example, the salmon tint of the mucous membrane of the genitals of cows in rinderpest is said to be fairly characteristic. Again, a *coppery tinge* (the "copper nose" of the London night cab horse) is a fairly significant indication of latent glanders and farcy; and the pink coloration of the eyeball in one form of influenza is so constant as to have given rise to the distinguishing name "pink eye."

In septicæmic diseases, the hæmolytic or blood decomposition changes occurring in the blood are evidenced by the formation of small circumscribed patches of congestion or apoplexy (rupture of small blood vessels) throughout the body, but especially on all serous and mucous membranes, and these are plainly observable in the living animal on the mucous membranes of the eye and nostril. They are called petechial spots, or "petechiæ," on account of their resemblance to a flea-bite, and are particularly noticeable in pupura and petechial fever in horses, malignant catarrh in cattle and sheep, and swine fever in pigs. "Ecchymosis" is a term implying a similar condition of punctate hœmorrhage in solid organs, and is found in the same diseases. A common term for this condition is "shotted," the organ presenting the appearance of having been peppered with pellets of small shot.

Besides alteration of colour, the visible mucous membranes may show other conditions which are signs of disease. A *desquamation*, or "peeling off" of the epithelial covering of the tongue or lining of the mouth occurs in foot and mouth disease and in thrush. Dryness of the mouth, nostrils and eyes is often present in inflammatory diseases, and may be accompanied by a shrivelling of the tongue, as seen in milk fever and in inflammation of the bowels. An unduly moist condition of the mouth is symptomatic of disease of the teeth, oftentimes of choking and of the presence of a foreign body, such as a pin or thorn. A furred condition of the tongue is not of so much use in diagnosing disease of animals, but there is in some forms of dyspepsia a foul appearance of the mouth, accompanied by a sour smell—what is often termed "soapy mouth."

PULSE.

The rhythmic expansion and contraction or the oscillation of the walls of the arteries constitute the pulse beat. It may be felt by the finger in superficially placed arteries, or may be seen on exposure of an artery. It is caused by a wave of pressure (not a wave of blood) passing along the walls of the arteries as a result of the impulse given by the contraction of the heart. This pulse wave travels along the arteries at the rate of 30 feet per second, but the speed diminishes as the distance from the heart increases; so that, although the pulse beat corresponds to the heart beat, it is not felt at the same time, but a little later. Blood travels along the arteries at a much less speed—about 1 foot per second—so that the blood which is expelled from the heart by any given heart beat does not reach the spot where the pulse is being felt until considerably later than the pulse beat corresponding to such given heart beat has passed. It is essential that this should be plainly understood—that the pulse is not a wave of blood, but a wave of pressure, and that the character of the pulse does not depend, except slightly, on the quantity of blood in the arteries or on its rate of flow, but on the action of the heart and the condition of the walls of the arteries. According as the heart is strong, regular, weak, fluttering, intermittent, irritable or violent, the pulse indicates its condition.

The pulse may be felt at any place where an artery runs over a bone or hard tissue subjacent to the skin. The most convenient place in the horse is at the lower jaw, just where the facial artery winds round from underneath to the side of the jaw in front of the fleshy part constituting the cheek. The artery in this situation lies bare between the bone and the skin, and if the middle finger is pressed gently against it on the inner aspect of the bone, the pulse can be most distinctly felt. Other situations in which the pulse can be taken are:—At the subzygomatic artery as it lies bare against the bone at a spot about 4 inches below the ear, just in front of the posterior border of the lower jaw, and an inch or so below the joint; at the great metatarsal artery as it is exposed between the bone and the skin at the upper part of the hind cannon on the outside in a groove between the cannon bone and the outer splint bone; at the inner side of the fore-arm just below the elbow joint the posterior radial artery may be sufficiently fixed against the head of the arm bone (radius) to distinguish the pulse; on the under side of the tail, in the medium line towards the root, the pulse may be taken by pressing the middle coccygeal artery against the vertebrae of the tail.

In cattle the pulse is usually taken at the lower jaw, at the carotid artery in front of the shoulder, or at the underside of the tail. When the animal is lying down it may be best taken at the metacarpal artery, just below the knee on the inside, or immediately above and behind the fetlock. The pulse of the sheep and dog may be taken at the inside of the thigh, where the femoral artery passes over the inner surface of the thigh bone.

The rate of the pulse varies slightly with the age and breed or temperament of the animal. The younger and the more highly-bred and highly-strung the more frequent the pulse. During "season," pregnancy, and lactation in females, the pulse rate is also somewhat higher. The average rate of the horse's pulse is 40 beats per minute. In coarse-bred or old horses, it may range as low as 35, and in young stock, thoroughbreds, and ponies, as high as 45. In cattle, the pulse is extremely variable, and its frequency is not to be relied on as a guide in the diagnosis of disease. When the animal is completely quiescent, the pulse rate ranges about the same as the horse, but during rumination, or when excited from any cause, as by the approach of strangers or by strange surroundings, or on separation from its calf or other cattle, the cow's pulse may go as high as 80 per minute. The pulse rate in dogs is from 100 to 120 per minute. In sheep the rate varies greatly, according to age, the average being from 70 to 80 per minute, but in young lambs it may reach as high as 95, and in old sheep as low as 55.

Character of the pulse.—Increase of frequency of the pulse, when occurring as the result of disease, and not from excitation or the influence of stimulant medicines, is usually associated with disease of a febrile nature, and with such diseases as congestion of the lungs, or any disease in which there is interference with proper oxygenation of the blood; the heart in such cases having to make up for the deficiency by quickening the rate at which the blood is passed through the lungs. Decrease of frequency occurs in coma (unconsciousness) and other brain diseases, in which, on account of decreased nervous stimulus, the heart's action is lowered or inhibited. Medicines and poisons of a narcotic character also effect infrequency of the pulse.

The terms "frequent" and "infrequent," referring as they do to the number of beats in a given time, must not be confounded with the terms

"quick" and "slow," as applied to the pulse. A *quick* or "*short*" *pulse* is one in which the time occupied by the individual beat is lessened, and is indicative of irritability or jerky weakness of the heart. A *slow or* "*long*" *pulse* is one in which the beat is prolonged, and occurs in gross or flabby conditioned animals. So that, contradictory as it may seem, it is possible to have a pulse which is at once frequent and slow, or infrequent and quick, although the usual combination is frequent and quick, or infrequent and slow.

When a pulse beat is occasionally omitted, as occurs in structural disease of the heart, the pulse is said to be *intermittent*, and intermission may be *regular*, that is, the beat may be omitted always after a definite number of beats, or *irregular* when the interval occurs in no definite order. An irregular intermittent pulse is often met with in cases of chronic indigestion. The pulse is also differentiated according to the variation of its volume as felt under the pressure of the finger. It may be *large* and *full* to the touch when the heart is acting forcibly, or it may be *full* and *weak* as in the "oppressed" pulse of pneumonia. A *small weak pulse* indicates a weak contraction of the heart after debilitating disease or anæmia. A *hard pulse*, which is usually the kind experienced in pleurisy, peritonitis, and like inflammations of serous membranes, is one in which the artery resists compression by the finger, and if to the hardness is added smallness the term "wiry" or "thready" is applied. The pulse is frequently *wiry* in the early stages of inflammation when there is an increased determination of blood to the inflamed organ, and a consequent diminution of volume of blood in the superficial arteries. In founder of the feet (laminitis) the pulse is frequently in the condition described as *round*, full and hard. Other varieties of pulse are the *soft pulse*, the *double pulse*, the *venous pulse*, and the *running down pulse* of excessive hœmorrhage or approaching death, but perhaps already enough has been said to show that the characteristics of the pulse, under the influence of disease are many and varied, and require for their proper recognition, differentiation and interpretation great delicacy of touch, a large amount of patience and fine discrimination added to wide experience.

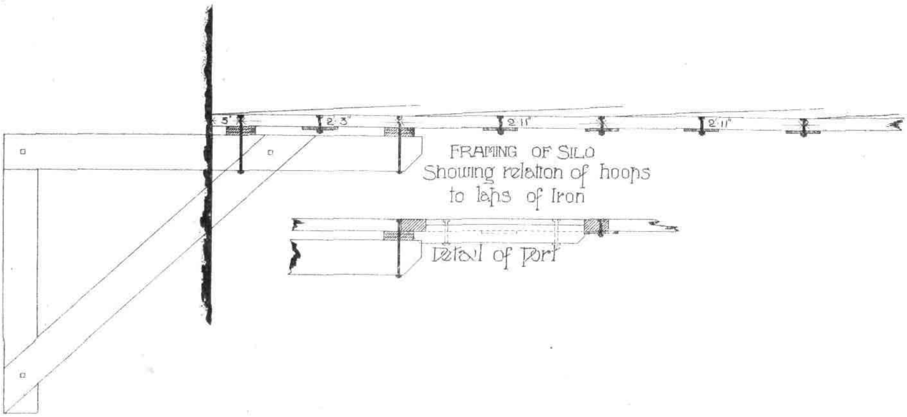
(To be continued).

BUILDING AN OVERGROUND SILO.

T. Cherry, M.D., M.S

The following considerations are to be borne in mind:—

1. The foundation must be firm enough to secure the silo when empty against the force of the wind.
2. The woodwork close to the ground must be protected against dry rot and white ants.
3. The material for the hoops requires to be straight grained, and free from knots and gum veins. A long lap is made at each splice, and bolts used so as to avoid splitting the timber.
4. The iron lining requires to have a lap of about 3 inches at the joints. If the clout nails are not more than 4 inches apart, the lining alone will be strong enough to take the pressure of the silage. The nails must be in the centre-line both of the lap and of the stud.



MATERIALS FOR SILO, 15 FEET DIAMETER, 21 FEET HIGH.

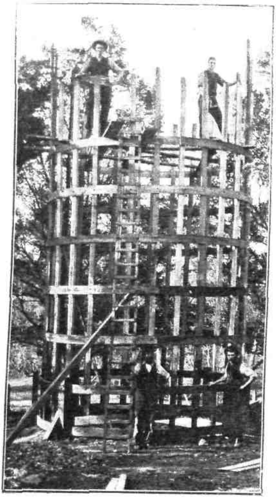
6 x 4 Redgum, 8/6, 8/5, 8/4.
4 x 2 Hardwood, 27/21, 6/24, 1/20, 6/16.
3 x 1 ,, 2/12.
6 x 1 ,, 4/11
6 x ½ ,, 60/18
8 6 x ½ Bolts, Nuts, and Washers.

16 9 x ½ Bolts, Nuts, and Washers.
16 8 x [illegible] ,, ,, ,,
250 3 x [illegible] ,, ,, ,,
100 4 x [illegible] ,, ,, ,,
56 sheets 6 x 3 x 24 G. plain Galvanized iron.
16/8 sheets Corrugated Galvanized iron.

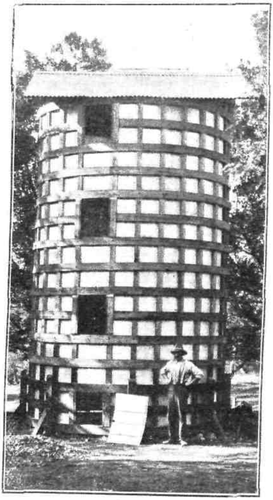
3 lengths 14" ridging.
2 lbs. springhead nails.
20 lbs. assorted wire nails, mostly 2".
20 lbs. 1" clouts.
2 lbs. Tinsmiths' rivets.
4 gallons tar or elastic carbon paint.

Specifications for Silo 14 feet 8 inches inside Diameter and 21 feet High.

All the materials used are to be of approved quality and the best of their kind. The timber to be specially free from knots and gum veins. The foundation posts, bottom hoops, and the bottom 3 feet of the studs to be tarred before fixing.



FRAME IN COURSE OF ERECTION.



SILO COMPLETE.

THE FOUNDATION.—Prepare eight foundation posts (6 x 4 redgum), as shown in sketch. Bolt the sole and post together edgeways, and halve the strut in both post and sole. Secure with ½ inch bolts. Fix a peg in centre of site, and with a trammel 7 feet 8 inches in length describe a circle. Dig for, and, when in position, fill in and well ram the posts 3 feet in the ground and 3 feet out of it, so that the inside face of each post is true to the end of the trammel. From the centre line of this face to the same line in the next post is 5 feet 10 inches, measured straight. Be careful to keep the inside face of each post exactly perpendicular. Make a composite curved plate by nailing three of the 6 x ½ boards to the inside of the posts, carefully springing the first of them to

the circle described by the trammel. Make butt joints, and let each successive hoop break joints. This hoop should be kept at least an inch from the ground. They require for the present only to be lightly nailed together, as they will be bolted to the posts in the way to be described below. A similar triple hoop is fixed, so that its upper edge is 35 inches from the ground. These two curved plates are used to fix studs in upright position safely.

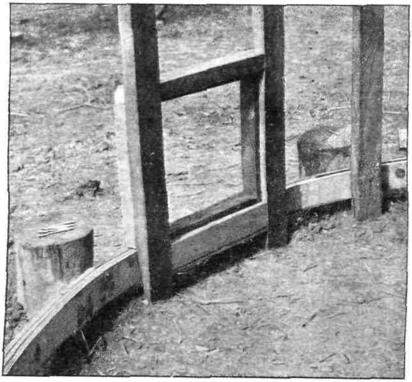
THE FRAMING.—The framing is made of 4 x 2 hardwood studs, placed sideways on the inside of the hoops. They are marked and bored for the $\frac{3}{8}$ bolts before fixing. The ends are kept an inch off the ground. Every fourth stud comes opposite one of the posts, and these are bolted with 8 x $\frac{3}{8}$ bolts passing right through the posts and studs. The intermediate ones are bolted with 4 x $\frac{3}{8}$ bolts to the curved plates. In all cases, keep the nuts on the outside of the silo, so that they may be tightened as the hardwood shrinks. The spaces between the studs (except the pair which take the port-holes) are $13\frac{1}{8}$ clear, measured on the inside edge of studs. A sheet of iron should be tried against every fourth stud, so as to see that the lap is correct. The hoops are $17\frac{1}{2}$ inches apart, centre to centre. The upper hoops are marked as to the line at which they will cross each stud before they are fixed, so that the diameter of the silo remains the same all the way up. This is done by first bending them round the outside of the circle of studs at 3 feet from the ground, and marking the position of each stud on the hoop. (Of course the hoop must be fixed to the stud from which it was marked.) The lap of the two boards forming the hoops should be from 24 inches to 30 inches, according to the quality of the timber, so as to more than cross two adjacent studs. Bolts are passed through these studs and both hoops, as shown in Fig. 5; $\frac{3}{8}$ bolts to be used to secure the hoops at every alternate stud. If the end of a hoop is cracked, bolt over the lap a fishing piece to cover three studs. The studs are kept plumb as the hoops are fixed. The first one to be erected should be one of the sides of the port holes.

THE LINING.—Twenty-four gauge galvanized iron is used. The lap is 3 inches on the studs, and one inch top and bottom. Press the sheets out to the line of the circle before nailing; 1 inch or $1\frac{1}{4}$ inch clout tacks are used, 3 inches apart along the lap, and 6 inches apart on the other studs. Three tinsmiths' rivets to be used between each stud to secure the horizontal lap. The edge of the lower sheet in each lap is *inside* the upper sheet, so as to exclude the weather.

THE ROOF.—Construct roof by bolting three 16 feet 4 x 2 purlins to the top of the studs of each half of the silo, allowing a pitch of about 3 feet to the ridge. Use 24 feet studs for the purpose of carrying the purlins, placing them in the circle where directed. Cover the roof with 8 feet corrugated iron 26 gauge, allowing one and a half corrugations lap, with spring-head nails at every third corrugation. Provide and fix three lengths of G.I. ridging 14 inch.

THE PORT HOLES.—The space between the last stud and the one first erected is made 22 inches clear. This makes the space between the last and the last but one less than 13 inches. A port is made in every second row of iron, the sill of the first one being 3 feet from the ground. The sill and lintel are made of 4 x 2, the top of the sill being flush with

the top of the hoop. The studs are backed up on their outer surface between the sill and lintel by pieces of 4 x 2, which are notched to cover the ends of the hoop corresponding to the middle of the port, and the whole secured with ⅜ bolts. The sill is nailed to the inside of the hoop so that it is flush with the studs on the inside. The stops are 3 x 1, set 1 inch back from the inside face. The rectangular piece cut from the corresponding sheet of iron is backed up with three or four pieces of 6 x 1, each 22 inches long, so that they fit close against the stops. The iron sheet then laps 1 inch or more all round the inside, and the pressure of the silage keeps the door against the stops. The doors are placed into position as the silo is filled, and they are knocked back into the silo as each becomes exposed, as the silage is emptied from the top. Short lengths of 4 x 2 studs may be placed between each lintel and the sill above, to support the iron lining.



PORT HOLE, FRAME SEEN FROM INSIDE OF SILO.

ROOF.—The roof may be left until the silo has been filled, as the silage forms a good scaffold to work from. The easiest method is to thatch it with straw, a few light saplings being laid across on top of the uppermost hoop, the straw thrown on top of them, well topped at the centre, and secured by a few strands of fencing wire from side to side. Another method is to make a low-pitched roof, as in the specification. The gable takes the head of the elevator. This roof may be covered with iron, paling, or ruberoid. The circular conical roof looks best, and is easily made. A light frame is secured to the tops of every third stud, and the rafters carried up to a centre post. It may be covered with flat iron, ruberoid, or 12 x 1 boards which have been ripped diagonally, so that all the points may be turned to the centre post. The need for a roof is

much less in dry districts, and it will be found that the rain which drifts down the inside of the half-empty silo does most of the damage. Still, when the silo has been built full height, it is advisable to complete the roof.

The cost of these silos may be calculated from the subjoined table of materials. In addition, a 100-ton silo requires 20 lbs. clout nails and 56 lbs. bolts and nuts. The contract price for the whole of the materials for the silo (15 x 21), as per specification, including roof, was £20 16s. (December, 1905). This included redgum foundation posts bolted together and tarred; studs bored for hoops, and tarred for 3 feet up, and the battens for the three lowest hoops were also tarred; all materials loaded on truck at North Carlton railway station. A silo 30 feet in diameter and 30 feet high (no roof) was erected at Adelaide Vale for £70. Another at Serpentine, 22 feet in diameter and 35 feet high (no roof) for £52. When more than 18 feet in diameter, it is handy to have a line of ports on opposite sides.

Overground Silos.

DETAILS OF DIMENSIONS, CAPACITY, AND MATERIALS REQUIRED.

Length of Trammel.	Inside Diameter.	Height.	Capacity.	Studs.	Battens.	Iron.	Approx. Weight. 6 x 3 x 24g. Black.	Approx. Weight. 6 x 3 x 24g. Galvd.
	Ft. In.	Ft.	Tons.			Sheets.	T. C. Lbs.	T. C. Qrs.
		21	45	...	60 17 ft. 6 x ½	49	0 7 0	0 8 3
6 9	12 10	24	56	29	66 ,, ,,	56	0 8 0	0 10 0
		30	80	...	78 ,, ,,	70	0 10 0	0 12 2
		21	60	...	60 18 ft. 6 x ½	56	0 8 0	0 10 0
7 8	14 8	24	73	33	66 ,, ,,	64	0 9 16	0 11 2
		30	100	...	78 ,, ,,	80	0 11 44	0 12 1
		21	76	...	80 17 ft. 6 x ½	63	0 9 0	0 11 1
8 7	16 6	24	94	37	88 ,, ,,	72	0 10 32	0 12 3
		30	130	...	104 ,, ,,	90	0 13 0	0 16 1
		21	95		80 18 ft. 6 x ¾	70	0 10 0	0 12 2
9 5½	18 3	24	118	41	88 ,, ,,	80	0 11 48	0 13 1
		30	160	...	104 ,, ,,	100	0 14 32	0 17 3
		21	135	...	100 18 ft. 6 x ¾	84	0 12 0	0 15 0
11 4	22 0	24	165	48	110 ,, ,,	96	0 13 64	0 16 3
		30	230	...	130 ,, ,,	120	0 17 16	1 1 1
		21	190	...	90 20 ft. 6 x ⅞	98	0 14 0	0 17 2
13 2½	25 9	24	230	57	100 ,, ,,	112	0 16 0	1 0 0
		30	310	...	120 ,, ,,	140	1 0 0	1 5 0
		21	270	...	108 20 ft. 6 x 1	112	0 16 0	1 0 0
15 0	29 5	24	320	65	120 ,, ,,	128	0 18 32	1 2 3
		30	450	...	144 ,, ,,	160	1 3 0	1 8 3

NOTES ON BUILDING THE SILO.

The foregoing directions should be followed out to the letter, as every point has been emphasized by the experience obtained in erecting nearly a hundred silos of this type. The foundation posts may be made

long enough to stand more than 3 feet out of the ground with advantage if the silo is intended to be more than 25 feet high. Round or split timber will do for the posts, but if these are used it is necessary to adze the inside face exactly perpendicular, so that the triple hoops may be quite true. The upper edge of the third hoop from the ground must be exactly 2 feet 11 inches. This then allows an inch of the first row of sheet iron to show above this hoop, and thus riveting may be done with ease. *The first port-hole may be made level with the lowest hoop if it is intended to excavate below the surface of the ground at any time*, as shown in the accompanying illustration; but, if not, it is handiest to make the first port 3 feet from the ground. The distance of 3 feet from one point to the next is not a disadvantage in practice, as when the silo is being emptied, as soon as the top of a port becomes visible, the silage is excavated from behind the door until it can be opened, and the silage then raked down the slope towards this port, instead of being worked quite level as is recommended for the next 3 feet. Should it be desired to fill the silo while it is being erected, there is no difficulty in doing so. The lining is commenced from the bottom, and kept two rows of sheets ahead of the filling. The sheets should be painted before they are nailed up, and whitewashed as soon as the riveting is complete. This extra treading on the silage is an advantage, and there is also no difficulty about the scaffolding. In the ordinary way, a couple of 9 x 1 planks are used as a scaffold, resting on the hoops in succession as the silo is built, and the iron is nailed on, beginning from the top. Remember that each row of iron loses 1 inch from the lap, so that the top edge for a 21 feet silo is 20 feet 6 inches from the ground. It makes a neat finish to the top if an extra 6 x ½ board is nailed on the *inside* of the studs, so as to project 4 inches above the edge of the iron. If thought advisable, the whole of the materials may be tarred or painted before erection, and the iron should always be treated in this way, at least on the inside, to protect it against any acids that may be formed. As an additional safeguard, two or three wire ropes (the same as those used for stays) may be placed round the studs, say, at 5 and 8 feet from the ground, and twitched up tight. This is advisable if the silo is 30 feet high, or in any height when the timber is not of first quality. In fixing the purlins for the roof, the edge of the studs hardly needs notching at all, the bolt being quite strong enough to hold them together. In very tall silos, where the foundation posts stand, say, 6 feet out of the ground, another triple hoop may be built as part of the foundation at this height, and in all cases when any of the lower hoops show weak parts (knots or gum veins), they should be strengthened by making them of a double thickness of 6 x ½ timber. The foundation hoops of silos above 25 feet diameter are made of two thicknesses of 6 x 1 instead of three of 6 x ½.

Staying the Frame.

A tall silo exposes considerable surface to the wind, and although the circular shape is the best to meet wind pressure, it is necessary to take precautions to keep it upright when empty. For this purpose stays are placed at regular intervals round the sides. Three of these are sufficient for a small silo, four for one 18 feet in diameter, and six for the larger sizes. They may be made of a good sapling, or built of 4 x 2,

as shown in the accompanying illustration; or, what is perhaps the best method, is to secure the frame by wire ropes (or six strands of fencing wire twisted together) to a good post twenty or thirty yards away. This allows the teams to draw in to the chaff-cutter without inconvenience.

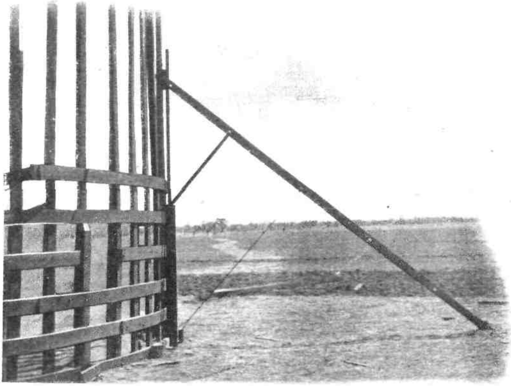


FIG 5.—DETAILS OF STAY. METHOD OF JOINTING HOOPS.

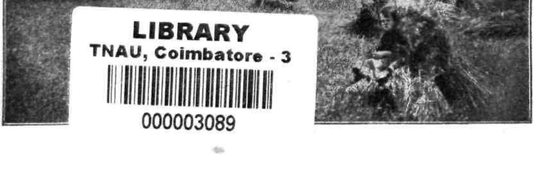
ENLARGING A SILO.

The silo built in this way is designed specially to allow of being increased in depth. The easiest way is to excavate the interior in a circle, as large as the inner face of the posts, to a depth of 6 or 10 feet or more. This gives 4½ clear all round, and allows of a brick lining. If the walls are good clay or slate reef, they may be made smooth enough without bricking, and in that case the diameter of the excavation is precisely the same as that of the finished silo, so that the inside face is perpendicular whatever the depth may be. Any irregularities may be plastered up with clay. If lined with brick, the inside should be finished smooth with a good coat of cement. When short lengths have to be used for the studs, these may be jointed in the following way:—The upper piece of 4 x 2 is halved for 9 inches, so that a 6 inch bolt is passed through the top of the lower 4 x 2, and then through the 2 x 2 tongue. In this way the upper studs are shifted sideways out of line with the bottom ones 2 inches; but the inside face is kept true. The long and short studs should be used alternately to break joints, and an extra hoop may be used to strengthen the silo in this part. As an instance of enlarging the silo, Messrs. McDougall Brothers, Minyip, built one 18 feet high last year, and now they have excavated it 10 feet below the surface,

and lengthened the studs by 7 feet, making the total depth 35 feet. In the rush of the first season's work, it is often impossible to build it more than 18 or 20 feet, but next year the depth should be increased to 30 or 40 feet. Remember, a narrow, deep silo is better than a broad, shallow one.

To Fill the Silo.

1. Before filling, whitewash the inside with a thick wash made of lime and skim milk. As this dries in a few minutes, it is sufficient to whitewash the iron each evening high enough to allow for next day's filling.
2. As the ports are placed in position, see that they fit closely all round. If necessary, use thin clay to lute the joint.
3. As the filling goes on, it is impossible to tramp it down too much, especially at the sides. Get the youngsters from the nearest school to spend a couple of hours in the silo each afternoon.
4. From 4 to 10 feet of filling a day is a satisfactory rate.
5. When full, wet the top layer of silage thoroughly. Then spread a layer of old cornsacks, and cover with at least 6 inches of sand or earth. This is specially required when the silage is made of one of the cereal crops, but is not so necessary if maize or amber is used, although even then it is an advantage. A cover made of bags sewn together, and tarred, will last several seasons.
6. The shorter the stuff is cut, the better—½ inch is better than 1 inch.
7. The elevator requires to be driven slowly for a chain-belt elevator, but quickly for a blower.
8. The ordinary chaffcutter, with horseworks, will fill a small silo, but an engine is better for the larger sizes.
9. Arrange the work of filling so that the sheaves are carted direct from the binder to the cutter.



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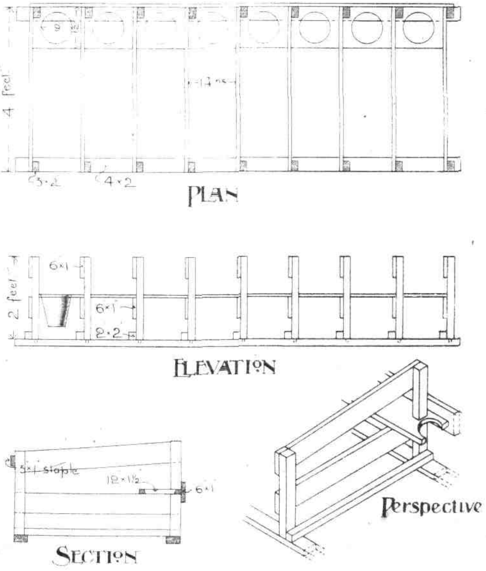
CALF-FEEDING AT CALROSSIE.

R. T. Archer, Dairy Supervisor.

Mr. D. T. McKenzie is one of the most widely known and most enterprising of farmers in the State of Victoria, and whatever is undertaken at Calrossie is conducted on the best known lines. So it is with calf-feeding. About 100 calves were being reared there at the time of my last visit, and the system adopted might well be copied by any one rearing calves, for it is recognised that the improvement of the herd has to take place through the calves. The best bulls for the purpose are obtained which insures the progeny being superior to their predecessors.



The accompanying illustration represents a set of calf-feeding bails made so that they can be easily lifted about from place to place. It consists of eight bails 14 inches wide by 4 feet long, made of two sole plates of 4 in. x 2 in. hardwood, into which at the front and back of each bail are mortised uprights of 3 in. x 2 in. The partitions are made of 6 in. x 1 in. and the sole plates are joined by 2 in. x 2 in. A piece of

6 in. x 1 in. runs along the front of the bails about half-way up, as shown in front elevation. Right across the front of bails, as shown, a 12 in. x 1½ in. hardwood plank runs, in which, in each bail, a round hole about 9 inches in diameter is cut. Into this a tin is placed, holding about 1½ gallons of feed. At the back of each bail-post a staple is fixed so that a 3 in. x 1 in. or 2 in. x 1 in. batten can be slipped to bail the calves up, or a chain hooked across. Another similar set of bails for older calves is made 5 feet from front to back, being a foot longer. The feed is put into the tins and eight calves are bailed up, each calf then gets his own allowance, and the advantage of this system is very evident when it is seen that often some of the calves have their allowance consumed before others have well started, some being very slow drinkers, others quick. These are prevented from getting too much and thus causing stomach troubles. The others are assured their share, and so instead of being weaklings, develop into sturdy, healthy animals. The tins are thoroughly cleaned out every day, as are also the pens and calf-house, the floors of which are of brick and cement. These are scrubbed down every day, thereby keeping everything sweet and clean and sanitary.

The calves are fed on their own mother's milk or beestings for three days, and new milk for two weeks, half new and half skim milk for another week or so, when they are put entirely under separator milk, with which a substitute of some kind is mixed. Cod liver oil is used at present. This is mixed in the milk as it runs from the separator, and in this way has the effect of preventing the accumulation of froth on top. If the froth is fed to calves it is sure to create stomach trouble, and should always be removed prior to feeding. The vats and other utensils used are kept scrupulously clean, and the milk fed at a proper temperature, as nearly as possible 100 deg. Fahrenheit. The calves are supplied with lucerne hay in racks so that after being fed they can nibble at it. This is a great assistance in rearing calves. A little fine hay supplied in this way often prevents calves from sucking each other's navels.

THE ARTIFICIAL MANURES ACTS.

Unit Values for the Year 1906.

W. Percy Wilkinson, Government Analyst for Victoria, and Acting Chemist for Agriculture.

The Victorian Artificial Manures Acts are framed expressly to protect any farmer from being charged undue prices for artificial fertilizers, and to insure that vendors of fertilizers deliver their goods up to the composition and quality claimed by label and invoice.

The first of these objects is secured in a more or less arbitrary, but nevertheless in a practically useful manner by annually establishing and publishing unit values for the fertilizing elements of Nitrogen, Phosphorus, and Potassium, in the forms in which they are contained in artificial manures. This is done on the basis of chemical analyses and declared sale prices for the current year of all manures handled on a commercial scale in Victoria.

Analyses are carried out in the State Government Laboratory of samples of all manures not liable to vary in composition required by the

Manures Acts to be submitted for analysis, once each year or oftener, by manufacturers and importers. From these analyses the unit values are calculated, and are applicable to all sales of manures for a period of twelve months from the date of publication in the *Government Gazette*.

The unit values are, in other words, the average trade values of the three most essential elements of plant foods, namely, Nitrogen, Phosphorus, and Potassium, in the forms in which they are commercially available.

The approximate value per ton of any fertilizer sold in Victoria is obtained by multiplying the percentages stated of the fertilizing ingredients by the unit values fixed therefor in the list and adding the separate values together:—Examples:—

1. Sulphate of Ammonia. Invoice certificate. 20 per cent. Nitrogen.

Calculation: 20 x 14s. 4d. ...	=	£14	6	8
Calculated value per ton ..	=	14	6	8

2. Superphosphate.—

Invoice certificate, 21 per cent. Phosphoric Acid (Water Sol.).
" " 2 per cent. Phosphoric Acid (Citrate Sol.).
" " 1 per cent. Phosphoric Acid (Insoluble).

Calculation—

Phosphoric Acid (Water Soluble), 21 x 4s. 6d.	=	£4	14	6
Phosphoric Acid (Citric Soluble), 2 x 4s. ...	=	0	8	0
Phosphoric Acid (Insoluble), 1 x 1s. ...	=	0	1	0
Calculated value per ton ...	...	£5	3	6

A noteworthy feature of the unit values fixed for the year 1906 is the substantial reduction in the valuations for compounds of Phosphorus as compared with those of previous years:—

	1894.	1900.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.
Phosphoric Acid (Water Soluble) ...	6 0	6 0	5 3	4 6
Phosphoric Acid (Citrate Soluble) ...	6 0	4 6	4 8	4 0

The decrease in the calculated value for an average superphosphate in 1900 as compared with that for the present year is striking.

The sample of superphosphate referred to in the above calculation would have been valued at £6 18s. in 1900, while its cost according to present market values is only £5 3s. 6d. This gratifying condition of the fertilizer market is to be attributed largely to the increasingly active competition in the rapidly expanding trade with artificial fertilizers. It is also in part due to improvements in the technique of handling and manufacture, and the increased facilities afforded to trade and manufactures by Australian Federation.

The protection of the pockets of purchasers of artificial fertilizers is an important aim of the Victorian Manures Acts. The laws render it illegal for any person to consign or sell in this State any parcel of manure exceeding 56 lbs. in weight, except under invoice certificate and attached printed labels. The invoice certificate and labels (tags) must convey definite information to enable the vendor to be identified, and the claimed value of the parcel of manure to be verified by chemical analysis. Thus the percentages of the commercially valuable constituents must be declared by

invoice and label. Any departure below certain limits from the declared percentages of plant fertilizing constituents and those found on analysis constitutes a breach of the law.

This system of compulsory declaration of percentages of fertilizing constituents in manures affords a considerable measure of protection to Victorian farmers. Every purchaser of manures possesses the right to send samples for analysis to an official analyst. By this provision of the Manures Acts any purchase of manure may be checked by the individual farmer with respect to the percentage values and quality claimed. An additional device for the protection of purchasers of manures is provided by the powers of inspection and analysis vested in the authorized officers of the Government Laboratory. The inspecting officers may enter any place where manures are stored, or in transit, and remove samples for analysis. The latest amendment of the Manures Acts, dated 10th October, 1905, *makes special provision for publication in the Government Gazette of analysis of all samples of manures taken by inspecting officers* of the Laboratory. The analyses *must be published* whether the samples comply with the Acts or otherwise. In addition, any analyses of manures collected by the inspecting officers, after publication in the *Government Gazette*, may be published in or by any newspaper circulating in any part of Victoria without rendering the proprietor, printer, or publisher thereof liable to any action or proceeding in any Court.

It may be confidently anticipated that this new "advertisement" provision of the Manures Acts will exercise an actively deterrent effect on any vendor of manures contemplating illicit personal benefits at the expense of Victorian farmers. It is a pleasure to acknowledge that the, so far, numerous inspections of manures made by the Chemical Branch have proved that infringements of the law are extremely uncommon considering the magnitude of the commercial transactions in artificial fertilizers, and the large values represented thereby. This satisfaction should not allow slack control to supervene. In view of the continuous extension in the application of artificial fertilizers close control of the traffic is alike essential to the financial interests of farmers, honest manufacturers, and honest vendors.

Modern agriculture everywhere tends more and more exclusively to intensive culture, the object being always to raise the maximum from a given area of ground, whether it be in grass, grain, fodder, fruit, or timber. Soils quite exceptionally contain the principal plant foods in proper proportions in forms readily available for plant nutrition. Even if this were the case, current systems of cultivation would tend to rapidly alter the physical condition and also create a deficiency in the soil of one or more of the essential elements of plant foods. On the other hand, most arable soils, all the world over, are more or less deficient in the assimilable forms of one or other of the plant foods, or of those at present relatively little known agencies which render the already existing fertilizing constituents of the soil eligible for plant nutrition. Such soils, owing to their deficiencies, cannot give a normal yield in return for the labour of ordinary cultivation, apart from fluctuating climatic conditions.

Accumulated data gained by scientifically conducted agricultural experimental work during the past 40 years have demonstrated in a most convincing manner the financial advantages to be won by the use of artificial and certain natural fertilizers for correcting soil deficiencies, and replenishing the losses to the soil caused by plant cultivation.

In a highly convenient and concentrated form most artificial and some natural fertilizers supply cultivators with a choice of all necessary plant foods. Used with intelligent judgment and discrimination, having a view to accurately ascertained soil deficiencies and plant needs, the artificial and natural fertilizers enable an increased return from the soil (apart from climatic considerations) to be counted upon with almost absolute certainty at actually minimum expense.

Cultural operations must not, however, be overlooked as an important factor in the production of continuous good returns. Thorough tillage, deep disturbance of the soil, and systematic rotations will always be prominent in maintaining the soil in the special physical condition enabling plant foods to be so assimilated as to assure the maximum fertility.

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1906 SEASON.

			s.	d.
1 per cent. of Nitrogen in the form of	Nitrate of Soda / Nitrate of Potash	is worth	15	6
1 ,, ,, ,,	Sulphate of Ammonia	,,	14	4
1 ,, ,, ,,	Blood Manure	,,	11	0
1 ,, ,, ,,	Fine Bonedust	,,	11	0
1 ,, ,, ,,	Coarse ,,	,,	9	6

In the mixed manures, such as Phosphate mixture, Bones and Digester Refuse: Blood Bone and Hashmagandy; Dried Blood and Organic Matter; Bone and Wood Ashes; Superphosphate and Gypsum; Bonedust and Gypsum; Bone, &c., Manure—1 per cent. of Nitrogen is valued at 9s. 6d.

If an invoice certificate does not state whether the Nitrogen in the Manure is in the form of Nitrate, or Sulphate, or Blood, or Bones, it is to be assumed to have the value of Bone Nitrogen.

			s.	d.
1 per cent. of Water Soluble Phosphoric Acid		is worth	4	6
1 per cent. of Citric Soluble Phosphoric Acid	Thomas Phosphates Nitro Superphosphates Ordinary Superphosphates Guanos	,,	4	0
1 per cent. of Insoluble Phosphoric Acid ...	Thomas Phosphates Nitro Superphosphates Guanos	,,	3	0
1 per cent. of Insoluble Phosphoric Acid in Ordinary Superphosphates		,,	1	0
In a Bonedust—				
1 per cent. of Phosphoric Acid in Fine Bone		,,	4	0
1 ,, ,, ,, ,, Coarse Bone		,,	3	0
1 per cent. of Potash		,,	5	6

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1906 SEASON—*continued.*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Potash.		*Estimated* Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
	Per centage	Per-centage.	Estimated Value in One ton of the Manure.	Per-centage.	Estimated Value in One ton of the Manure.	Per-centage.	Estimated Value in One ton of the Manure.			
			£ s. d		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mainly Nitrogenous										
Sulphate of Ammonia	..	20.88	14 19 3	..	..	..	..	14 19 3	14 10 0	Cuming, Smith, and Coy., William-street, Melbourne
"	..	20.85	14 18 10	..	..	..	..	14 18 10	15 0 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
Nitrate of Soda	..	15.06	11 13 5	..	..	..	..	11 13 5	12 0 0	" " " "
"	..	15.41	*11 18 10*	..	..	..	..	*11 18 10*	*12 0 0*	Cuming, Smith, and Coy., William-street, Melbourne
Blood Manure	22.94	11.29	6 4 2	.76	0 2 3	.15	0 0 9	6 7 2	6 10 0	Jno. Cooke, Collins-street, Melbourne
"	41.38	8.58	4 14 4	.86	0 2 6	.17	0 0 11	4 17 9	7 10 0	W. Angliss and Coy., Footscray
"	5.94	13.09	7 4 0	..	..	..	..	7 4 0	9 0 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
Mainly Potassic										
Kainit	..	..	..	..	..	13.52	3 14 4	3 14 4	5 0 0	Cuming, Smith, and Coy., William-street, Melbourne
Potash Nitrate	..	13.25	10 5 4	..	..	47.41	13 0 9	23 6 1	20 0 0	" " " " "
Potash Chloride	..	..	..	..	..	61.80	16 19 10	16 19 10	13 0 0	" " " " "
"	..	..	..	..	..	58.46	16 1 6	16 1 6	13 10 0	Renard Fertilizer Coy. Propy. Ltd. " "
"	..	..	..	..	..	61.62	16 18 0	16 18 0	13 10 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
Potash Sulphate	..	..	..	..	..	51.19	14 1 6	14 1 6	14 10 0	Renard Fertilizer Coy. Propy. Ltd.
"	..	..	..	..	..	52.07	14 6 4	14 6 4	14 10 0	Cuming, Smith, and Coy., William-street, Melbourne
"	..	..	..	..	..	48.44	13 6 5	13 6 5	14 10 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1906 SEASON—*continued*.

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Water Soluble. Per-cent-age.	Phosphoric Acid. Water Soluble. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Citrate Soluble. Per-cent-age.	Phosphoric Acid. Citrate Soluble. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Insoluble. Per-cent-age.	Phosphoric Acid. Insoluble. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Total. Per-cent-age.	Phosphoric Acid. Total. Estimated Value in One ton of the Manure. £ s. d.	Estimated *Total* Value of Manure per ton. £ s. d.	Price asked for Manure per ton Delivered at Local Railway Station. £ s. d.	Where Obtainable
Mainly Phosphoric.—Phosphoric Acid readily Soluble.														
Superphosphate ("Hasell's Jap")	11.22	..	..	20.20	4 10 10	1.62	0 6 5	..	..	21.82	4 17 3	4 17 3	4 7 6	A. H. Hasell, 10–12 Queen-street, Melbourne
" Standard (Flag brand)	7.85	..	..	18.17	4 1 9	2.78	0 11 1	.63	0 0 7	21.58	4 13 5	4 13 5	4 5 0	Renard *Fertilizer* Coy. *Propy.* Ltd., William-street, Melbourne
" Standard "B" ..	5.64	..	..	11.56	2 12 0	2.97	0 11 10	.34	0 0 4	14.87	3 4 2	3 4 2	4 0 0	" " "
" Ordinary ..	5.54	..	..	20.29	4 11 3	1.48	0 5 11	.36	0 0 4	22.13	4 17 6	4 17 6	4 5 0	P. Rohs, Bendigo
" " ..	9.56	..	..	17.13	3 17 0	2.27	0 9 0	..	..	19.40	4 6 0	4 6 0	5 0 0	J. Cockhill, Post Office-place, Melbourne
" Florida ..	4.46	..	..	20.63	4 13 9	1.02	0 4 0	.43	0 0 5	22.08	4 18 2	4 18 2	4 10 0	Cuming, Smith, and Coy., William-street, Melbourne
" Concentrated ..	13.15	..	..	40.33	9 1 5	4.43	0 17 8	..	..	44.76	9 19 1	9 19 1	12 10 0	" " "
" Malden Is. Guano	3.56	..	..	17.13	3 17 0	3.63	0 14 6	4.00	0 4 0	24.76	4 15 6	4 15 6	5 0 0	" " "
" Wischer's ..	10.99	..	..	21.02	4 14 7	.99	0 3 11	..	..	22.01	4 18 5	4 18 6	4 10 0	Wischer and Coy., Market-street, Melbourne
" Ordinary ..	9.55	..	..	18.65	4 3 11	1.24	0 4 11	1.45	0 1 5	21.34	4 10 3	4 10 3	4 5 0	" " "
" " ..	6.62	..	..	18.51	4 3 3	2.12	0 8 5	2.00	0 2 0	22.63	4 13 8	4 13 8	4 10 0	Australian Explosives and Chemical Coy., Melbourne
" 15%	6.26	..	..	13.63	3 1 3	2.28	0 9 1	1.61	0 1 7	17.52	3 11 11	3 11 11	3 18 0	" " "
" Special ..	9.45	..	..	21.86	4 18 4	2.08	0 8 3	..	..	23.94	5 6 7	5 6 7	4 15 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
" No. 1 ..	8.91	..	..	19.25	4 6 7	1.61	0 6 5	.67	0 0 8	21.53	4 13 8	4 13 8	4 5 0	" " "
" No. 2 ..	9.45	..	..	17.03	3 16 7	1.72	0 6 10	.59	0 0 7	19.32	4 4 0	4 4 0	4 0 0	" " "
" Concentrated ..	12.17	..	..	38.47	8 14 1	5.54	1 2 1	.72	0 0 8	44.73	9 16 10	9 16 10	12 0 0	" " "
Containing Nitrogen also.														
Superphosphate, Nitro ..	6.90	1.32	0 12 6	14.17	3 3 9	2.15	0 8 7	1.32	0 4 0	17.64	3 16 4	4 8 10	5 0 0	Australian Explosives and Chemical Coy., Melbourne
" Bone Nitro ..	6.27	1.63	0 15 6	12.39	2 15 9	3.57	0 14 3	4.73	0 14 2	20.69	4 4 2	4 19 8	5 0 0	Cuming, Smith, and Coy., William-street, Melbourne

MELBOURNE MARKET DURING THE 1906 SEASON—*continued*.

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local *Railway* Station.	Where Obtainable.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.			
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Containing Nitrogen also—continued.														
Superphosphate and Bonedust	7.25	1.75	0 16 7	7.13	1 12 1	11.19	2 4 9	3.89	0 11 8	22.21	4 8 6	5 5 1	5 0 0	Cuming, Smith, and Coy., William-street, Melbourne
" "	9.65	.97	0 9 2	13.78	3 2 0	4.55	0 18 2	.81	0 2 5	19.14	4 2 7	4 11 9	5 5 0	J. Cockbill, Post Office-place, Melbourne
" "	10.20	1.00	0 9 6	5.35	1 4 1	13.62	2 14 6	2.88	0 8 8	21.85	4 7 3	4 16 9	5 0 0	Waddell and Coy., Kensington
" " No. 2	8.74	.81	0 7 8	13.07	2 18 10	5.29	1 1 2	2.29	0 6 10	20.55	4 6 10	4 14 6	4 15 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
" " Standard	6.56	1.16	0 11 0	12.25	2 15 2	4.38	0 17 6	3.27	0 9 10	19.90	4 2 6	4 13 6	5 0 0	Renard Fertilizer Coy. Propy. Ltd., William-street, Melbourne
" Standard Nitro	6.42	1.37	0 13 0	10.28	2 6 3	5.56	1 2 3	2.95	0 8 10	18.79	3 17 4	4 10 4	5 0 0	" "
" Nitro ..	9.71	1.60	1 0 0	16.26	3 13 2	2.24	0 9 0	..	..	18.50	4 2 2	5 2 2	5 0 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
Phosphoric Acid moderately Soluble.														
Thomas Phosphate, Standard Flag Brand	..	..	..	..	..	13.17	2 12 8	4.33	0 12 11	17.50	3 5 7	3 5 7	4 0 0	Renard Fertilizer Coy. Propy. Ltd., William-street, Melbourne
" (Star Phosphate)	..	..	..	..	..	13.02	2 12 0	4.40	0 13 2	17.42	3 5 2	3 5 2	4 5 0	" " "
"	..	..	..	..	..	11.87	2 7 6	4.63	0 13 10	16.50	3 1 4	3 1 4	4 0 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
Phosphoric Acid difficultly Soluble.														
Guano	..	.58	0 5 6	..	..	..	..	..	..	9.45	1 13 4	1 18 10	2 0 0	Garnsworthy and Coy., Williamstown
" (Malden Island) ..	..	..	..	..	..	..	..	..	..	30.70	4 12 1	4 12 1	5 0 0	Cuming, Smith, and Coy., William-street, Melbourne
"	..	..	..	..	..	..	..	..	..	13.07	1 19 2	1 19 2	3 0 0	J. Sinclair, Portarlington

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1906 SEASON—*continued.*

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Per-cent-age.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Mechanical Condition. Per-cent-age of Fine Bone.	Mechanical Condition. Per-cent-age of Coarse Bone.	Mechanical Condition. Nitrogen. Per-cent-age in Fine Bone.	Mechanical Condition. Nitrogen. Per-cent-age in Coarse Bone.	Mechanical Condition. Phosphoric Acid. Per-cent-age in Fine Bone.	Mechanical Condition. Phosphoric Acid. Per-cent-age in Coarse Bone.	Estimated total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£. s. d.							£ s. d.	£ s. d	
Containing Phosphoric Acid and Nitrogen.—Phosphoric Acid difficultly Soluble.														
Blood, Bone, and Digester Refuse	7.02	7.55	3 15 6	11.44	1 18 8	30.23	69.77	1.91	5.64	4.40	7.04	5 14 2	5 15 0	Thos. Borthwick and Sons Ltd., Portland
Animal Fertilizer	10.89	6.35	3 2 0	12.81	2 0 9	19.04	80.96	1.15	5.20	2.40	10.41	5 2 9	5 10 0	Newport Freezing Works, Newport
,, ...	4.79	6.70	3 11 2	11.28	1 19 11	54.61	45.39	3.63	3.07	6.00	5.28	5 11 1	5 10 0	Jno. Cooke, Collins-street, Melbourne
,, (with Blood)	6.78	7.64	3 17 0	9.03	1 10 7	39.11	60.89	2.91	4.73	3.50	5.53	5 7 7	6 0 0	,, ,, ,,
Magic Fertilizer	19.23	1.56	0 15 6	14.21	2 7 7	44.98	55.02	.47	1.09	5.01	9.20	3 3 1	4 5 0	Geo. Gardiner, Marshalltown, Geelong
Bonedust, Magic No. 1 ..	11.65	1.79	0 17 8	17.60	2 18 1	32.60	67.80	.53	1.26	5.41	12.19	3 15 9	5 0 0	,, ,, ,,
,, Magic No. 2 ..	13.81	2.08	1 0 6	16.28	2 13 8	37.09	62.91	.52	1.56	4.84	11.44	3 14 2	4 15 0	,, ,, ,,
,, Standard Flag Brand	6.21	4.29	2 3 5	20.85	3 16 1	49.00	51.00	1.70	2.50	10.69	11.13	5 19 6	6 0 0	Renard Fertilizer Coy. Propy. Ltd.
,, ...	8.44	2.11	0 18 6	17.17	2 16 11	36.50	63.50	.17	1.18	5.48	11.69	3 15 5	5 5 0	H. J. Feore and Coy., Richmond
,, ...	19.16	2.18	1 1 6	11.44	1 18 2	38.52	61.18	.52	1.66	3.82	7.62	2 19 8	5 10 0	P. Fitzgerald, East Brighton
,, ...	6.77	4.09	2 1 1	21.60	3 12 5	37.65	62.35	1.51	2.58	7.70	13.90	5 13 6	5 5 0	P. Rohs, Bendigo
,, ...	14.32	3.78	1 18 1	19.15	3 5 2	40.83	59.17	1.47	2.31	7.82	11.33	5 3 3	5 10 0	J. Cockhill, Post Office-place, Melbourne
,, ...	9.51	3.12	1 12 0	19.38	3 9 4	55.36	44.64	1.61	1.51	11.19	8.19	5 1 4	5 15 0	Heinz Bros., Ballarat
,, ...	7.71	2.84	1 8 5	16.52	2 17 0	43.47	56.53	1.00	1.84	7.48	9.04	4 5 5	5 0 0	Pennell Bros., Braybrook
,, ...	10.88	2.30	1 3 0	21.74	3 14 11	36.57	63.43	.80	1.50	9.76	11.98	4 17 11	5 0 0	Waddell and Coy., Kensington
,, ...	7.96	2.42	1 4 0	21.75	3 12 5	37.28	62.72	.68	1.74	7.08	14.67	4 16 5	5 10 0	Cuming, Smith, and Coy., William-street, Melbourne
,, Special	6.89	4.52	2 5 2	17.10	2 17 5	35.98	64.02	1.52	3.00	6.14	10.96	5 2 7	6 0 0	,, ,, ,,
,, ...	6.12	3.63	1 16 11	21.72	3 15 6	48.68	51.32	1.65	1.98	10.42	11.30	5 12 5	5 10 0	Kensington Manufacturing Coy., Kensington
,, ...	8.03	4.08	1 19 10	20.85	3 6 9	25.46	74.54	.72	3.36	4.27	16.58	5 6 7	5 10 0	A. E. Kleiner, Wangaratta
,, ...	6.72	3.45	1 14 0	24.50	4 0 7	31.40	68.60	.85	2.60	7.15	17.35	5 14 7	5 5 0	J. W. Branch, Geelong
,, ...	4.48	3.46	1 15 6	22.98	4 1 9	57.10	42.90	1.75	1.71	12.79	10.19	5 17 3	5 10 0	J. A. Little and Son, Ararat
,, ...	7.65	4.35	2 2 3	20.42	3 4 8	18.59	81.41	.68	3.67	3.38	17.04	5 6 11	5 10 0	Jno. R. Ellsworth, Ballarat
,, ...	6.72	2.62	1 6 3	25.23	4 6 4	42.10	57.90	.95	1.67	10.70	14.53	5 12 7	5 10 0	Executors, Jas. Brown, Hamilton
,, ...	4.42	4.24	2 3 3	21.45	3 15 0	50.17	49.83	1.94	2.30	10.67	10.78	5 18 3	5 5 0	Boyle and Williams, Echuca
,, ...	6.17	3.69	1 16 8	22.45	3 14 0	33.48	66.52	1.09	2.60	6.68	15.77	5 10 8	5 10 0	S. and F. Bugg, Kyneton

List of Unit Values of Manures in the Melbourne Market during the 1906 Season—*continued*.

Description of Manure.	Moisture. Per-centage.	Nitrogen. Per-centage.	Nitrogen. Estimated Value in One ton of the Manure	Phosphoric Acid. Per-centage.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Mechanical Condition. Per-centage of Fine Bone.	Mechanical Condition. Per-centage of Coarse Bone.	Mechanical Condition. Nitrogen. Per-centage in Fine Bone.	Mechanical Condition. Nitrogen. Per-centage in Coarse Bone.	Mechanical Condition. Phosphoric Acid. Per-centage in Fine Bone.	Mechanical Condition. Phosphoric Acid. Per-centage in Coarse Bone.	Estimated total Value of Manure per ton.	Price asked for *Manure* per ton Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Containing Phosphoric Acid and Nitrogen.—Phosphoric Acid difficultly Soluble—continued.														
Bonedust	6.06	3.23	1 12 9	21.92	3 18 3	52.45	47.55	1.41	1.82	12.57	9.35	5 11 0	6 0 0	Mt. Lyell M. and R. Coy., Queen-street, Melbourne
"	9.86	3.97	1 18 8	20.65	3 6 0	18.45	81.55	.65	3.32	4.05	16.60	5 4 8	6 0 0	J. R. Jopling, Ballarat
"	8.34	3.72	1 16 10	23.11	4 1 0	49.55	50.45	1.68	2.04	11.77	11.34	5 17 10	6 0 0	C. Sargeant, Warragul
Bone Manure	16.00	2.39	1 3 3	7.41	1 4 1	30.70	69.30	.40	1.99	1.89	5.52	2 7 4	5 0 0	A. W. Redman, Union-street, Brunswick
Bonedust and Blood Fertilizer..	16.78	2.89	1 9 10	16.61	2 18 2	48.27	51.73	1.61	1.28	8.28	8.33	4 8 0	5 0 0	Waddell and Coy., Kensington

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1906 SEASON—*continued*.

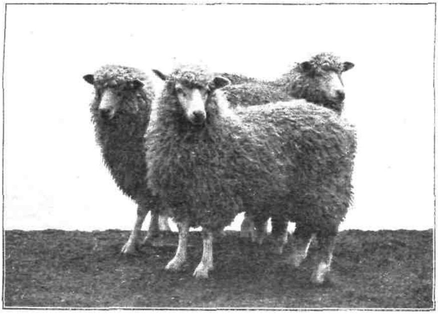
Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.				
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.						
	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Estimated Total Value of Manure per ton.	Price asked for Manure *per ton* Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mixed Manures, containing Phosphoric Acid, Nitrogen, and Potash.																
Potato Manure ..	8.17	1.00	0 15 6	8.38	1 17 7	5.36	1 1 5	5.90	0 17 9	19.62	3 16 9	6.52	1 15 11	6 8 2	6 0 0	Cuming, Smith, and Coy., William-street, Melbourne
Orchard and Onion Manure	3.64	1.75	1 7 1	15.57	3 10 1	1.79	0 7 2	.32	0 1 0	17.68	3 18 3	5.74	1 11 7	6 16 11	7 0 0	" "
Grass Manure (Pasture)	4.17	1.72	1 6 8	9.82	2 4 2	6.32	1 5 3	6.86	1 0 7	23.00	4 10 0	2.93	0 16 1	6 12 9	6 0 0	" "
" (Top Dressing)	4.00	1.57	1 4 3	18.76	4 4 5	1.31	0 5 3	.33	0 . 0	20.40	4 10 8	.26	0 1 4	5 16 3	6 0 0	"
Leguminous Manure ..	3.32	..	..	18.23	4 2 0	1.81	0 7 3	.39	0 1 2	20.43	4 10 5	5.64	1 11 0	6 1 5	5 0 0	" "
Horticultural Manure ..	3.06	3.31	2 11 3	11.72	2 12 9	1.84	0 7 4	..	..	13.56	3 0 1	10.99	3 0 5	8 11 9	8 10 0	" "
Pea and Bean Manure	6.92	..	..	11.55	2 12 0	3.32	0 13 3	1.33	0 4 0	16.20	3 9 3	4.00	1 2 0	4 11 3	5 0 0	Australian Explosives and Chemical Coy.
Potato Manure ..	6.47	..	..	16.09	3 12 5	2.81	0 11 3	1.40	0 4 2	20.30	4 7 10	3.12	0 17 2	5 5 0	6 0 0	" "
Bone and Wood Ashes ..	11.94	1.75	1 7 1	..	..	5.58	1 2 4	3.84	0 11 6	9.42	1 13 10	.44	0 2 5	3 3 4	4 0 0	A. E. Kleiner, Wangaratta

W. PERCY WILKINSON,
Government Analyst
and
Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 20th December, 1905.

THE LAMB TRADE.

A. A. Brown, M.B.B.S.



CROSSBRED (LINCOLN MERINO) LAMBS.

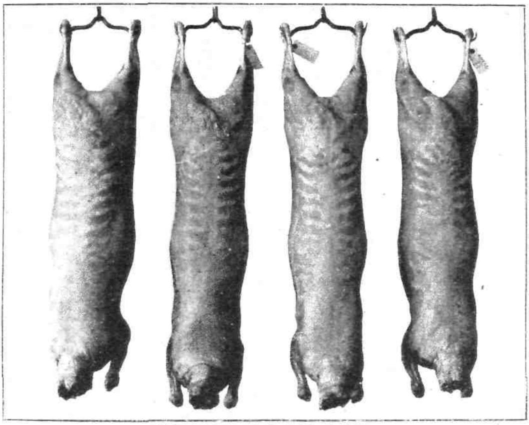
About 7 months old. Killed at Messrs. Wm. Anderson and Co's. Flemington Meat Preserving Works for export.

The industry in Victoria of raising lambs for the meat export trade is capable of enormous expansion if conducted on proper lines. The business is as yet only in its infancy, and when its possibilities are thoroughly appreciated, graziers will bestow something more than passing attention on an industry that affords such a wide scope of operation, and that secures such quick returns.

In the Annual Report of the Department of Agriculture for 1890, I remarked that the time was not far distant when sheep would be specially reared for export. An incentive has now been given to farmers to breed lambs for export by the tempting prices offered for prime lambs of a quality suitable for the trade. Farmers in districts where the railways are of easy access should bestow particular attention on the matter, as, by devoting their energies to the raising of lambs, they might be enabled in time to abandon the drudgery associated with many of the every-day occupations of the farm. Pastoralists now are beginning to devote more care in the selection of breeds to meet both the requirements of the export of meat business, as well as the wool industry. Unfortunately, in many cases, no systematic efforts are being made to top off lambs for market, and I am quite convinced, from my knowledge of the business, that if the system were universally practised, the enhanced returns would more than repay any outlay in the direction of making provision for suitable fodder to fatten the lambs.

With the breaking up of the large estates wider vistas open to view, and with attention concentrated on breeding the proper class of animal for meat export purposes, and the growing of fodder crops to supply the wants of the animals, it is practicable, in those districts where the water supply

is plentiful and certain, to greatly augment the number of sheep depastured, and so permit of an extensive trade in frozen lamb carcases being continuously carried on. With careful attention directed to breeding the best varieties of sheep, and to the proper methods of growing fodder crops to supplement the natural pastures, raising lambs for export will, within a few years, rival the dairying industry in value, and I am optimistic enough to say that it will indeed eventually become the most important industry in the State. The dairying industry is an exacting one to those engaged in it, whereas the lamb industry has more congenial associations and surroundings to those who pursue it. In the raising of lambs for export, the hours of toil would be shorter, labour troubles would not press



SHROPSHIRE-CROSSBRED LAMBS.

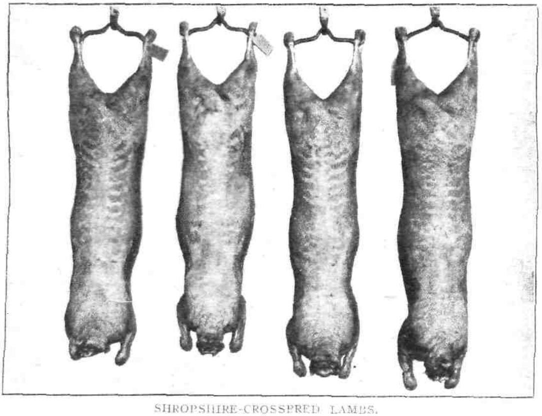
Nine months old. Average weight of carcasses 45 lbs. The lambs were a cross between Shropshire ram and Lincoln-Merino ewe. The carcasses show stout legs and short, thick, plump bodies. They are excellent export lambs.

so acutely on those concerned in it, and the conditions of life on the farm would be rendered more attractive and pleasant. The whole secret of the enterprise turning out successfully depends upon making ample provision for supplying fodder continuously to the flock, and method and management circulate around the feeding problem.

Before touching upon the various special aspects surrounding the industry, one naturally asks what is the commodity that the London merchants require to supply the wants of their lamb trade. To meet the purposes of their lamb trade, London merchants want young lambs, direct from the mothers, and this country can supply them when no other country, except the Argentine, can. The Argentine is our most formidable competitor on the London markets, but those interested in the industry, and who have visited the Argentine, declare that we have nothing to fear from that country, because our lambs are generally superior in quality to theirs. In that

country, tape worms and round worms are prolific inhabitants of the intestines of lambs, and when lambs are invaded by these parasites they fail to thrive. The seasons in the Argentine certainly correspond with our own, but, not only are the flocks infested with worms, but scab extensively prevails, so that pastoralists find it impossible to fatten lambs in any quantity. The Argentine, however, is a large exporter of mutton, and in that commodity, perhaps, will prove a powerful enough competitor. Lucerne crops are grown extensively in the Argentine, but are said not to have the nourishing qualities possessed by similar crops grown on Victorian soil.

When the practice of properly feeding lambs is generally established in Victoria, graziers will realize prices equal to what is obtained by New Zealand producers on the London markets. In fact, lambs of Victorian



SHROPSHIRE-CROSSBRED LAMBS.

Under 6 months old. Average weight of carcasses 34 lbs. The lambs were a cross between Shropshire ram and Lincoln Merino ewe. Note thick legs and plumpness of carcasses. At this age, or younger, this breed commands the highest prices on the markets.

origin, if properly tended, should command higher prices, since our climate is more genial, and therefore more favorable to the rapid development of the lamb and the cultivation of fodder crops, than that of New Zealand.

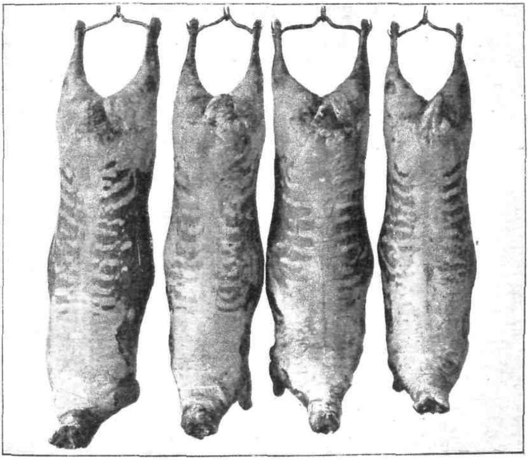
The lamb export season in Victoria usually commences in September, but it may some years begin in August. The lambs exported from Victoria are placed on the London markets in October, November, December, and January. In consequence of seasonal differences, lambs from New Zealand are not placed on London markets till February, March, April, and May. The lambs raised in Britain itself are placed on the market in June, July, and August. It may be interesting to know that Britain, for its extent of country, runs more stock than any other nation over a similar area. In 1903, there were 11,408,560 cattle and 29,658,840 sheep in the United Kingdom, and there were killed for food purposes during that year about 11,432,000 sheep and lambs, the products of the nation. In addition,

there were imported something like 15,810,000 carcasses of mutton and lamb, of which Australia sent 478,037, New Zealand 5,078,651, and the Argentine 5,900,000. Of the Australian proportion, Victoria sent 233,504 It was not until April, 1903, that one of the most terrible droughts that ever devastated Australia broke, so 1903 cannot altogether be taken as a criterion of the Australian trade.

In 1904 there were exported from Victoria—

372,918	lamb carcasses	Value £291,600
72,134	mutton carcasses	65,800
864	beef bodies	9,600
18,800	veal carcasses	31,000
1,708	pork carcasses	2,660

The total value of the meat export trade for 1904, including all frozen and canned products (beef, mutton, rabbits &c.) amounted to £651,245.



CROSSBRED (LINCOLN-MERINO) EWES.

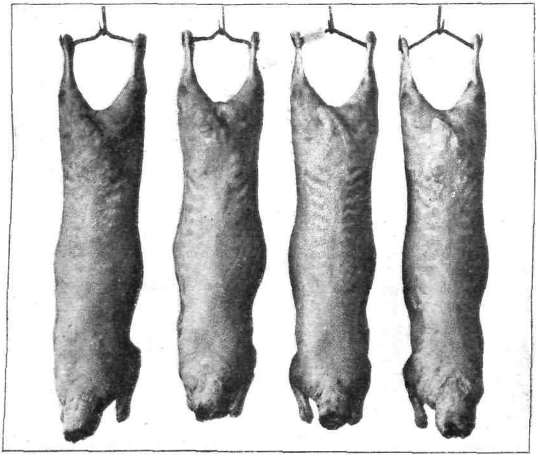
Average weight of carcasses, 95 lbs. Best breed to raise for export of mutton and to cross with the Shropshire for production of export lambs. The carcasses, although indicating the best breed for the purpose, are, however, in this particular case, too heavy for the trade.

GROWTH OF VICTORIAN EXPORTS.

	Mutton.	Lamb.
1897	... 196,623	
1899	... 307,065	
1900	... 257,432	
1904	72,134	... 372,918
1905	59,252	... 589,855

In 1904, there were in New Zealand 18,280,806 sheep, of which 9,222,448 were breeding ewes. In that year, New Zealand exported 2,050,542 carcasses of mutton and 1,917,026 carcasses of lamb, and 144,647,376 lbs. of wool. In that country there are 21 freezing works, capable of freezing 4,000,000 sheep per annum, and there is a fleet of steamers specially equipped with refrigerating plants engagd in carrying the cargoes to Great Britain.

The latest returns indicate that there are 10,167,691 sheep in Victoria The State, no doubt, is capable of producing sufficient sheep for its own requirements, but a considerable number of fat and store sheep are annually imported from the Riverina. There were slaughtered for food purposes



CROSSBRED (LINCOLN-MERINO) LAMBS.

Ten months old. Average weight of carcasses, 46 lbs. These carcasses show fairly thick legs, and although plump enough are rather long. They are fairly good export lambs.

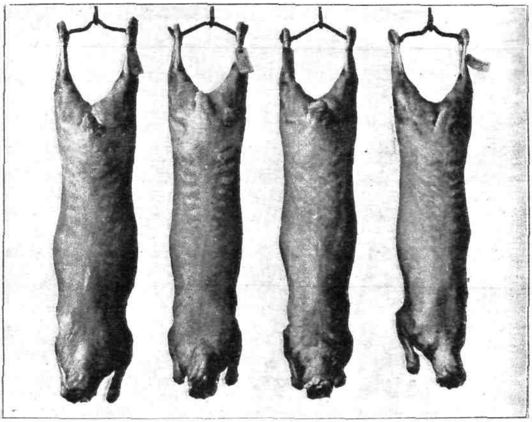
in Victoria during 1904, 2,305,729 sheep and lambs, and there were exported 123,208,133 lbs. of wool, the average production per sheep being about 7½ lbs. The value of the wool exported amounted to £5,452,973.

The increase in the number of sheep in Europe, America, and Australia is not keeping pace with the increase in population, and the number of meat consumers is increasing out of all proportion to the number of sheep being raised. The population in meat-eating countries is steadily increasing, and the increase in the number of sheep is not keeping pace in a corresponding fashion. In Australia the number of sheep will always be a fluctuating quantity, seeing that the country will always be subject to

periodical droughts. These facts indicate to graziers in favoured localities the enormous possibilities of grazing sheep for export. There is, perhaps, at present, more money made in raising sheep in proportion to the money invested than in raising any other species of live stock.

Feeding and Management.

The natural pastures of Victoria, except in certain favoured districts, cannot be continuously relied upon to fulfil the requirements of providing feed for stock, and in order to make the industry successful it is necessary that great attention should be paid to the feeding of lambs. In good seasons grasses and herbage may be abundant, and lambs may then, perhaps, be readily got into prime condition on the natural pastures for



SOUTHDOWN LAMBS (THREE-QUARTER BRED).

About 7 months old. Average weight of carcasses, about 35 lbs. Legs not so thick and carcasses generally not so plump as Shropshire cross. They are, however, good export lambs.

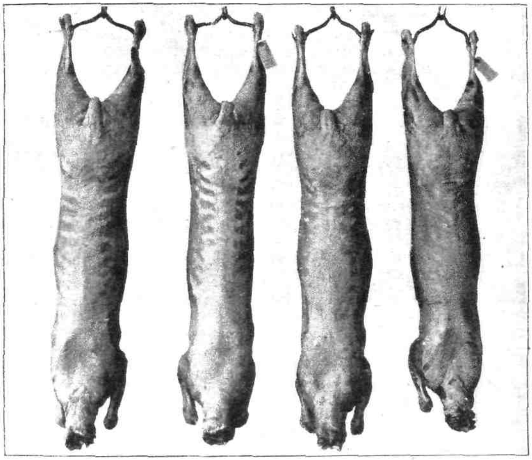
early shipment. But to rely on the natural pastures in Australia to supply the wants of animals is simply courting disaster. Seasons are very unreliable, and it behoves every one embarking in the industry of raising lambs for export to grow fodder crops. From the time the lamb is born until it reaches the slaughter-house, it should not be allowed to receive any check in its development. When, by privations of hunger, a lamb receives a set-back in its career, it is very hard to get it to regain condition, and when it does so it is generally in the *weaner* stage, and its value has depreciated. The lamb must be enabled to thrive from the very start of existence, and become prime quality in the shortest time possible, and this can only be done by supplying abundance of food. In adverse seasons, lambs soon fall away in condition, and, if they have to travel far to the railway, the evil is

accentuated. Where railways are fairly accessible, the industry should flourish. As a matter of fact, the railways play a most important part in making the industry a success. If the farms are very distant from the railways, the lambs fall away much during the journey over the roads to the trucks, and also over the rails to the abattoirs, whereas, if railways are close to the farms, the lambs do not suffer nearly so much damage in transit to the abattoirs.

Every grazier, to be successful, requires to cultivate a portion of his holding, so that plenty of feed may always be available for the requirements of his stock. Even in good seasons, when the natural pastures are amply clothed, it is surprising what excellent results are obtained in feeding lambs on special crops. The feeding of lambs on special crops, in addition to the grasses picked up on the natural pastures, makes all the difference between decided success and indifferent returns in the enterprise. The time has arrived in Australia when proper attention must be bestowed in making provision for feeding stock. On small holdings, where rainfall is reliable, this will, no doubt, be done. Even on large holdings, in districts where rain is uncertain and water scarce at times, ensilage in the good seasons should be made from the natural grasses and sown crops, and conserved for times of scarcity. The conservation of fodder is one of the most important factors in connexion with the continuance of the industry. To insure continuous success, something more than the natural grasses are required. True enough, there may be seasons when lambs can be fattened rapidly on natural pastures, but such seasons are the exception, and not the rule. In indifferent and poor seasons, lambs cannot be properly fattened on the natural pastures, and so artificial fodder is an essential factor in getting them into prime condition. Suitable forage crops should be grown to supplement the feed derived from the natural pastures, and, in all districts of the State where the soil is suitable and water available, either from rain supply or irrigation methods, lucerne can always be grown, and lucerne is good feed to top off lambs. Lucerne grows well on river flats, but it also thrives well on uplands. Under irrigation it grows well in Mildura, and the breeding of lambs for export is an industry that can be profitably combined with fruit-growing there. In Mildura, leguminous crops, for the purpose of enriching the soil with nitrogen compounds, are now being generally grown, and the crops should be availed of to the best advan age to meet both the requirements of the orchard and the feeding of stock. By feeding the crops to stock, and allowing the stock, when conditions are favorable, to graze over the ground, then, for all practical purposes, manurial requirements are fulfilled. By putting the forage through animals, better and quicker results are achieved than if it were simply allowed to rot on the ground. In going through the animal, rapid transformations take place in the forage, and when it leaves the animal, it is brought close to a form in which it can easily, by certain soil bacteria, be rendered suitable for the requirements of plants. Lucerne in summer and autumn, and rape in winter, are perhaps the best of all fodders to supplement the natural pastures. Rape and lucerne can be grown in almost every part of the State where it is possible to practise with success lamb raising for export. With proper management, excess lucerne could be cut and converted into hay, and lucerne hay could be fed to sheep during winter or bare summers. In certain districts, rape and millet luxuriantly thrive. The rape should be sown in early autumn, particularly in Gippsland and in the Western District, just after the first rains have fallen. By sowing in early autumn,

good feed is available right through the winter, and perhaps no fodder crop tops off lambs better than rape. For summer feed, besides lucerne, maize and amber cane could be grown, and excess growth should be converted into ensilage. Rye and cocksfoot are always good grasses to sow down in districts where rainfall is certain and soil suitable. In topping off lambs, mangels and turnips are also excellent foods.

In lamb raising for export, the growing of fodder crops is an essential condition to insure success. The difference in prices between prime and ordinary lambs points out the advantages of proper feeding. Graziers happily circumstanced as regards rainfall and water supplies, should not hesitate to put down fodder crops. Grasses require regular renewal, and



UNSUITABLE FOR EXPORT REQUIREMENTS.

Lambs 10 months old, of a nondescript breed. Average weight of carcasses, 36 lbs. The carcasses, although animals were well fed, show long thin legs and generally a want of plumpness.

the kinds suitable to particular soils should always be grown. By properly feeding lambs and sending them to market in prime condition, graziers are well repaid the trouble and expense incurred in fetching them up to prime condition by the higher prices commanded for the animals when they are of first quality.

In seasons when forage is plentiful, the excess should be converted, depending upon its character, either into hay or ensilage. All who wish to conduct the industry on approved lines must always have at command plenty of food-stuffs. Surplus grass should be made into ensilage. In the form of ensilage, the juices of the grasses are conserved. Ruminants require juicy foods, and, if ensilage is made, a succulent food is always at

hand to be fed to stock during dry summer months, at which season indeed they require juicy food the most. The making of bush hay, or stack ensilage, is possible in good seasons in all districts. The waste of good pasturage that occurs in seasons of plenty is something astounding. Bush hay, or stack ensilage, if kept for seasons of adversity, would tide many graziers over troublesome periods. During periods of drought, the losses of live stock have been appalling, and, if the surplus grasses of good seasons were converted into bush hay or stack ensilage, the enormous losses that have hitherto ruined many pastoralists would, perhaps, be obviated, or, if not actually obviated, would at least be minimized. Of course, the labour aspect demands consideration, but it would be found profitable to undertake the work, notwithstanding the industrial difficulties to which attention has been drawn.

The appropriate manuring of pastures is a matter that must not be overlooked, if their continued fertility, at a high level, is demanded, and therefore the lands should be lightly dressed annually with superphosphate, bone-dust, or other requisite manure.

It is important to notice that lambs should be marked and castrated early, so as to avoid the check to development that the operations involve. The proper arrangement of the paddocks for the lambs to graze over, so that the flocks can be shifted, say, once a month, from one paddock to another, is expedient. This transference of the flocks from one paddock to another tends to keep the pastures clean.

All methods that will enable the lambs to thrive from the outset of existence and become prime quality in the shortest period possible must be practised.

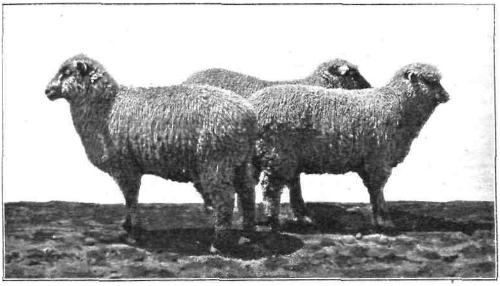
SHELTERING STOCK.

Shelter should be provided in all paddocks to protect stock from the inclemency of season. It is a singular fact that few stock-owners make proper provision for sheltering stock. The winds of winter, and, indeed, those occasionally of other seasons, are very cold, and if belts of timber were planted ample shelter would be provided from wind, hail, and rain. Neglect to provide shelter has often entailed serious losses in the flocks. When shorn sheep and young lambs are exposed to cold and wet, mortality may be great. The expense of planting trees is not great, and the increased value of the property well repays the trouble. It is wise to plant trees that will not only afford shelter, but that will serve as fodder in times of scarcity.

The pepper tree and African box thorn will grow in any part of the State, no matter how arid, and make splendid shelter, but stock will not eat the leaves of these trees. The *Pinus Insignis*, once it gets a hold, resists droughts, and makes capital shelter, but it is also uneatable. In districts suitable to their growth, sugar gum or currijong trees should be planted. The leaves of these two trees are edible, but sheep would not eat them so long as other more nutritious fodder abounded. The value of the currijong as a fodder in times of drought is incalculable. To feed stock, the branches should be simply lopped off, and on no account should the trees be felled, for it is a wanton waste to do so. After being denuded of the limbs, the trees quickly recover, and, as a matter of fact, they seem to be invigorated by the trimming to which they have been subjected. The leaves contain considerable quantities of moisture, so the trees are particularly adapted for feeding during drought

periods. It is not to be thought that stock will fatten on currijong like they do on saltbush, but they can be kept alive on it. Stock eat not only the leaves, but the soft parts of the branches as well. Stock effectively sheltered thrive well, and are easily kept in forward condition. Exposure to cold makes great demands on the animal economy. Animal heat is dependent upon the slow combustion of foods ingested, and, if the heat of the body be properly conserved by rugging and sheltering animals, there is less waste of tissue in keeping their fire aglow, and consequently less food is required to keep them in a healthy and prime condition.

(*To be continued.*)



SHROPSHIRE-CROSSBRED LAMBS.

About 6 months old. Killed at Messrs. Wm. Anderson and Co.'s Flemington Meat Preserving Works for export.

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases.

The Carnation.

The garden carnation is a descendant of *Dianthus caryophyllus*, a species indigenous to Britain and parts of Europe. It has been cultivated for many centuries, a record existing of an importation of plants into England from Poland in 1597. The types are numerous, and at various times have been arranged into classes, each denoting some particular arrangement of colour in the flowers, or growth in the plants. The classification adopted in Australia is—(1) the spring blooming or show section, which is again subdivided into self, flake, bizarre, picotee, fancy, and decorative kinds; and (2) the perpetual or tree carnation of semi-shrubby habit, which is divided into show and decorative classes. A show carnation of either section should have broad petals, free from serration, and a long calyx that does not "burst" unevenly. Decoratives, which include most of the best winter blooming varieties as "H. Plumridge," "Peach Blossom," &c., are fringed or serrated at the edges of the petals, and the

calyces often burst at one side. The show carnations are usually stouter in the petals than the perpetuals, and endure heat better, but there is no doubt that the latter are the most suitable for general cultivation, as they flower over a long period, and grow into large plants under proper treatment, producing quantities of blooms suitable for all decorative purposes.

PREPARATION OF SOIL AND PLANTING.

The carnation will thrive in any fair garden soil that is well drained. Good drainage is probably the most essential factor in the cultivation of this plant. The soil should be deeply worked and a fair quantity of well-rotted stable manure mixed through it. In heavy, retentive soils the addition of sand, wood ashes, or other material that will make the soil porous, is necessary. In very light, sandy soils add strong loam or clay

DARK FLOWERS. ALL PERPETUAL BLOOMERS.

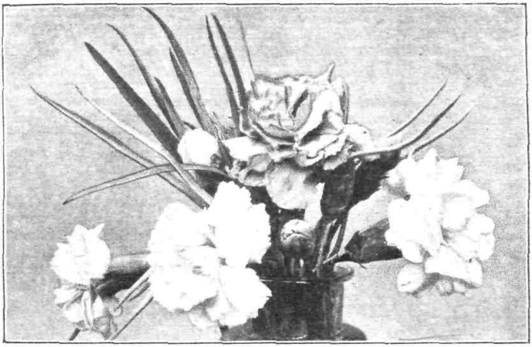
Left :—"Tanner's Scarlet," scarlet; right :—"Tommy Atkins," maroon, flaked red; top :—"H. Plumridge," maroon; bottom :—"Incomparable," buff, edged scarlet.

to the lower spit, and tread the soil firmly before planting. Though carnations will thrive in mixed groups or beds among roses and other plants, special beds should be prepared if fine flowers are desired. A sunny sheltered position is most suitable. Narrow beds that will accommodate two or three rows of plants, about 3 feet between the rows, are best. The plants may be set $1\frac{1}{2}$ to 2 feet apart in the rows. Such a bed can be easily covered to protect the blooms, if necessary, or may be enclosed with wire netting if rabbits or hares are troublesome. Early autumn is the best time to plant. The ground being warm, the plants soon become established and will flower the following spring.

PESTS AND DISEASES.

Mealy bug is the worst enemy of the carnation grower. It penetrates to the deepest roots, and once established it is impossible to eradicate it. It will spread from plant to plant, and ruin a collection in a very short time. The effect is a general sickly, yellow appearance, and the only remedy, destruction of the plants affected. Caterpillars of various kinds

attack carnations. The most destructive are the larvæ of the Agrotis and other cut worms which inhabit the surface soil in the day-time and feed on the plants at night. The soil should be examined and the caterpillars destroyed. An occasional spraying with Paris green will keep looper and other small caterpillars under. Soot worked into the soil lightly near the plants deters both bug and caterpillar. Carnation "rust" and "spot" are fungi that are occasionally found attacking plants, especially when grown in cold, damp situations. The affected leaves or parts should be removed and burned, and the plants kept as dry as possible. Dusting the plants with lime and sulphur, equal parts of each, or spraying with sulphide of potassium, 1 oz. to 2 gallons of water, is the best means of combating these and other fungi.



LIGHT COLORS.

Left:—"J. Keyston," yellow edged red, spring blooming picotee; right:—"Trojan," white, show carnation; top:—"Mrs. Hamilton," buff flaked rose, perpetual fancy; bottom:—"Princess Alice," white striped cerise, perpetual fancy.

Flower Garden.

Dahlias will need a deal of attention this month. The plants should be kept growing freely, and the growths supported as made. An excessive number of shoots should not be allowed; six or eight, according to the strength of the plants, being sufficient. In thinning, the inside shoots should always be removed. The plants will require a liberal supply of water during dry, hot weather, and the surface of the beds should be stirred occasionally. If the blooms are required for exhibition, an occasional "watering" with liquid manure will be beneficial.

Chrysanthemums grown for large blooms must be regularly attended to. The "crown" buds must be saved on most kinds to get first-rate blooms. This bud usually appears in the point of the shoots during February, surrounded by growth buds. The flower bud is round and occupies the centre of the shoot. All other buds, *i.e.*, growth buds, should be removed with a sharp pointed knife, particular care being taken not

to injure the flower bud. Allow the buds to grow to some extent before applying liquid manure. March is early enough to begin to "feed" plants growing in the open ground.

Roses that have been allowed to grow steadily should now receive a top-dressing of manure and be liberally watered to induce free growth. A profuse autumn flowering will result in the case of the tea and hybrid-tea varieties. Roses are not liable to be attacked by thrips to a great extent in the autumn, but will need to be carefully examined for mildew and aphis. An early dusting with sulphur in the case of the first, or spraying with nicotine in the latter, will save a lot of trouble later.

Early in March is the right time to plant bulbs of Daffodils. The soil should be prepared some time before, and ought to be deeply worked and some well-decayed manure mixed thoroughly to the bottom. This applies to the preparation of ground for bulbs generally. Bulbs of some species may remain in one position undisturbed for several years, but they will not be very satisfactory unless the ground has been properly prepared at planting time. Good drainage is an absolute necessity. Very fine blooms of Anemone "St. Brigid" were exhibited at the metropolitan flower shows last spring. This anemone is not new, but has been greatly improved by cultivation and selection. It will not succeed in light sandy soils, but in strong loams it is one of the best spring blooming plants in cultivation. Anemones and Ranunculus should be planted this month. If they are not planted early they develop their flowers in warm sunshine when they are of little value.

The hoe should be freely used in all beds and borders that have not been mulched. A light dressing of bonedust or superphosphate worked in with the hoe will greatly improve the flowers of Delphiniums, Cannas, and other plants that will bloom during autumn. Seedlings of perennial and early-sown annual plants will need careful shading and watering. They must not be overshaded or the plants will be drawn and weakened. Plenty of air should be admitted, and the shading removed after the heat of the day is past.

Kitchen Garden.

As the ground is cleared of peas, potatoes, and other crops, manure should be liberally applied and worked in, so as to be prepared for the planting and sowing of various vegetables for winter use. Next month a deal of ground will need to be ready for planting if a succession is to be maintained. Beds, too, will be required for the sowing of seeds of cabbage, cauliflower, &c., from which plants will be available for late planting. In a garden where vegetables are to be produced for an ordinary household, frequent sowings and plantings are necessary. In short, it is largely perpetual preparation, sowing, and planting. Rotation should be observed as far as possible. The ground should be kept well cultivated between young growing plants. Thin out well when necessary. A few good specimens of any given vegetable are preferable to a cart-load of rubbish, and are easily produced if fair root room and plant food are allowed.

Seeds of French bean and pea may be sown early. Cabbage and cauliflower (early and late varieties), turnip, lettuce, and radish seed should also be sown. Plantings should be made from former sowings of cabbage, cauliflower, and celery, taking advantage of cool or moist weather for the purpose.

ROSES—INSECT ENEMIES.

(Continued from page 61.)

C. French, F.L.S., F.E.S., Government Entomologist.

WHITE SCALE (DIASPIS ROSÆ).

A white scale insect infesting the rose, raspberry, blackberry, currant, and other members of the same orders of plants. Male, winged; colour, light amber with dark, irregular markings, wings white. Female, wingless, eggs red colour, form oval, and from twenty to fifty under each scale. This serious pest of the rose is one which, if not well looked after, will not only render the plant unsightly, but will kill the latter outright, so that, as in the case of most of our insect troubles, the spray pump must be kept going. Upon the first indications of the presence of this scale, cut the plant as hard back as possible for the time of the year. Get a nailbrush or something of the kind, and after having burned the prunings, proceed to scrub the thicker shoots, using either a resin compound, kerosene emulsion, or even nicotine and soap boiled up together, and with this give the woody parts a hard scrubbing. For the weaker shoots, spray with a well-diluted resin compound or soaperine. If the plant be badly affected, take it carefully up during the months of either June or July, cut it back, then immerse the whole plant for 24 hours in a solution of tobacco water. Give the plant stems another good scrubbing, and after disinfecting the soil with some lime, or, better still, muriate of potash, replace the plant, and watch it carefully for a time. The white scale is not easy to stamp out, the great secret of success being to constantly watch the plant, and if the slightest traces of the scale be visible, act promptly.

LOOPER CATERPILLARS (GEOMETRID MOTHS, SEVERAL SPECIES).

The so-called "loopers" are larvæ of small moths, the name of looper having been given to the caterpillars on account of their looper-like attitude when in motion. The female moth deposits her eggs upon the young bud of the rose blossom, and, when hatched, the tiny grub at once commences to bore into the bud. If not at once noticed, the blooms so attacked are done for. The geometers belong to a group of Lepidoptera largely represented in Australia, and included amongst them are many of the worst of our "leaf-roller" pests so well-known to the rose-grower. Spray with either white hellebore, weak Paris-green, or nicotine.

RED SPIDER (TETRANYCHUS TELARIUS).

This well-known pest of growers is not, strictly speaking, an insect, as it belongs to the great group of acarids or mites. Still, I have considered it of sufficient importance to include in this article. The red spider is one of the most troublesome and, in some cases, one of the most destructive of pests, the eggs remaining both in the soil and on the plants during the whole season. The tiny animals, when full grown, are red in colour, hence their title. Deterrents are here again in evidence. When the foliage is firm, spray with either quassia, hellebore, or a weak kerosene emulsion. When spraying, keep a full strength solution for the soil, as upon examination, especially if the soil be a heavy one, myriads of the tiny beasts are to be found in it, and there remain until the late spring, when they sally

out for their work of destruction. Where it can be judiciously done, keep the hose and syringe going, as once the "spider" tackles the foliage it soon spoils the latter's beauty. The red spider must be kept at in the early stages. If the "web" be once formed it is most difficult to destroy the pest without much injury to the plants themselves. Spimo, a great home remedy for spider on hops, might with advantage be tried here on roses as well as on other plants.

RUTHERGLEN FLY (NYSIUS SP.).

This is a small but formidable pest of the rose grower. It is one of the tiny species of plant-bugs, and is one of the worst of our all-round insects. The perfect insects are winged, and are to be seen in countless millions. When they settle upon a rose bloom they at once commence to drive their beaks into the petals, and then the whole of the nourishment required to form the perfect flower is sucked out, the buds being left on the plant shrivelled, blackened, and dying. As these insects congregate in rubbish, it is desirable to mulch the roses with grass, and at daybreak remove the mulching bodily, and burn it. The crevices in the soil are also great harboring places for this pest. The soil should, therefore, be sprayed with a strong (1 in 8) kerosene emulsion. When the pest makes its appearance it must be tackled at once, and always either in the morning, before the sun gains power, or after dusk. In the case of roses, it will be difficult to use any material strong enough to kill the insects without damaging the tender foliage of the rose. Smoke fires, although successful, is but a half-hearted way of dealing with the pest, for instead of destroying the insects, you drive them on to your neighbour's property, where they hibernate until the following season. The Rutherglen fly is a hard nut to crack, and will look at the ordinary treatment meted out to insect pests as merely in the light of a huge joke, and will even thrive upon a spraying with undiluted fusel oil. I find, however, that the beast does not like either quassia chips or pyrethrum insecticides, so I would recommend these materials as worthy of a trial.

LIGHT BROWN APPLE MOTH (CACÆCIA RESPONSANA).

This small but very destructive moth is next to the codlin, our most dangerous insect pest of the apple grower. The perfect insect is yellowish brown, the grubs being not unlike those of the codlin moth. As in the former species alluded to, the eggs are deposited upon the face, also in the folds of the rose petals, and the grub, when hatched, eats into the bud, thereby causing it either to fall off the tree or is otherwise rendered useless. In the case of this pest, deterrents should be used, and for this purpose the pyrethrum insecticides dusted on the young flower buds are very useful. Occasional sprayings with a weak (1 in 20) kerosene emulsion has also been used by many with much success. This moth frequently deposits its eggs about dusk and early in the morning, and, owing to the great damage it does, is well worth watching. I have seen a dozen or more buds ruined in a single night, and, as the trouble is not at once noticeable, it will be seen that careful observation and prompt treatment are necessary to attain success.

MEALY BUG (DACTYLOPIUS).

The "Mealy Bug" of gardeners is a great pest, especially as it attacks the roots as well as the branches of the plant, and will be quite at home

in soil of any kind, especially heavy soil. This pest is more troublesome to persons who force roses, either in pots or in tubs. The bug does not appear to do much harm to roses when they are planted out of doors. When this insect appears upon the plant above ground, spray with kerosene emulsion, and in spraying for this pest especially, the liquid must be forced on to the plant with as much force as is consistent with the constitution of the rose to be treated. When the bug is on the root of the plant, disinfect with either bisulphide of carbon placed in the soil, by means of an "injector," or sulphate of iron. In planting roses on old and used land, great care must be taken to treat the soil before planting with some muriate of potash, which is almost a specific against peach aphis when at the roots.

CUT WORMS (EUPLEXIA NIGERRIMA AND OTHERS).

This pest, the name of which I here give, is a terrible pest in rose gardens, the habits of the parent mother being mostly similar to that of the preceding species. The larvæ or grubs are of a dirty greenish brown colour, and are fairly active when at their work of destruction. This grub is a most voracious feeder, and will ruin a large number of rose buds in a very short space of time. It will also attack the leaves. The moth of the species here named is black, with a few white markings. We have reared it from the rose and the carnation buds. Other noctuid moth grubs will also tackle the rose, but this is, I fancy, the worst species for florists' flowers. Spray with white hellebore or nicotine. A good plan is to mix bran, arsenic, and treacle together into a paste, and at dusk lay pieces here and there amongst the plants. *Formula*: 50 lbs. bran, 12 lbs. arsenic, 6 lbs. treacle.

STICK-CASE MOTHS (METURA AND ENTOMETA).

These insects, whilst in the larval state, are a great trouble to growers. A very few of the grubs, with their singular stick nest, will soon make short work of the foliage of a rose or any other plant which they select for attack. The perfect insect is a small moth. The female is quite destitute of wings. It both makes and inhabits the case above mentioned. The males, although common, are but rarely seen, and are best captured by means of placing a female under a wire meat cover, or a sieve, and in this way they are easily attracted. As an illustration, I may say that for nearly 50 years I have been collecting insects, and have only taken two male specimens of these moths in the ordinary way. Fortunately, these grubs are easily killed, and a few applications usually suffice for the purpose. Take 1 lb. Paris green (paste form is the easiest), 4 lb. lime, mix and dilute for most plants, say, 1 gallon of the mixture to 160 gallons of water. The grubs, being leaf-eaters, are at once poisoned by the material sprayed on to the plants affected. In the case of roses, it is seldom that the grub attacks the foliage until the latter is well ripened, so that the mixture can be used at a fairly strong rate. There are a few other, and smaller, stick-case insects which attack the rose, but these are not sufficiently numerous to do any considerable damage.

JASSID (JASSIDÆ).

We now come to a tiny green cicada-looking beast, which, for its size, bids fair to become one of the rose-growers' worst pests; at least, when the plants are in bloom. This insect makes its appearance in the hottest weather, and, like the "Rutherglen fly," simply swarms on the leaves as

well as on the blooms. Comparatively speaking, this insect is of recent introduction as a garden pest, although it is supposed to be a native of this State. The group to which this insect is allied contains some of the most extraordinary forms of all insect life. Let us hope that this beast may soon take its departure. Deterrents in the way of quassia, hellebore, emulsions of all kinds, and also care as to the manure used, will have to be adopted. Trapping should be done soon after daylight, or after the sun has lost its power.

THE ORCHARD.

James Lang, Harcourt.

January has been unusually dry, and the fruit trees are beginning to show signs of suffering from want of moisture. Where there is a good supply of water available, and the orchard has been irrigated, the trees and fruit are looking well. Through the lateness of the season, fruit is not as large as is usually the case in January, and will be from three weeks to a month later in maturing. This will have to be borne in mind when marketing the fruit, especially for oversea markets; if picked in an immature state, the fruit soon shrivels.

The apple crop in many districts of the State is very light, and orchardists are apt to neglect the necessary spraying for Codlin moth, but whether the crop is light or heavy, the moth will have its share, unless kept in check by spraying. Where only a few apples are on a tree it is perhaps better to pick them off, rather than expend labour in spraying; the trees that have a good crop can then be better looked after. Bandages also should be examined every ten days or so in the dry districts, as the grub, after leaving the apple, soon enters the chrysalis stage, and the second brood of moths appears.

Strawberry plantations also should be looked over, and if the runners are not required for next season they should be cut off. In selecting runners for planting, it is advisable to take them from plants that fruit well, rather than indiscriminately from the bed. There are strains in plants the same as in animals, and it should always be the aim of the orchardist to propagate only from those trees or plants that are of a good fruit-bearing strain.

February is the best month for budding fruit trees. If bark does not rise freely, give the stocks a good soaking of water. This will cause the bark to rise, and make the operation a success.

It is much to be regretted that a uniform case Act has not yet been passed by Parliament. It is nothing less than a scandal to the fruit-growers that such a state of things in regard to fruit cases should continue for so long. The matter has been under the consideration of the Central Fruit-growers' Association for some years, and, so far, nothing has been done. It is difficult to say how many different sizes of fruit cases come into the market at the present time, but the number is very great, to the manifest loss of the fruit-grower. The buyer, knowing the difference in the size of cases, will take good care to be on the safe side in estimating the weight of the contents, and will only pay accordingly. If uniform cases of a bushel capacity only were allowed to be used, the buyers would know exactly the weight of the contents.